

LOWER LIMB

By: Dr-Khaled Milad

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* Best wisher.

د/خالد ميلاد

VISIT...

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SKIN OF LOWER LIMB

[A] Buttock (Gluteal region) :-

* Cutaneous nerves of the buttock are :-

① Upper medial quadrant :- by:

- Posterior rami of upper three lumbar & upper three sacral nerves (L_{1,2,3}, S_{1,2,3}).

② Upper lateral quadrant :-

- Lateral branches of subcostal ^(T₁₂) & iliohypogastric nerves (L₁)

③ Lower lateral quadrant :-

- branches of lateral cut. nerve of thigh (L_{2,3}).

④ Lower medial quadrant :-

- branches of posterior cut. nerve of thigh (S_{1,2,3})

⑤ skin over coccyx :- (in natal cleft "between buttock")

- branches of lower sacral & coccygeal nerves.

[B] The thigh

① Lateral cut. branch of subcostal nerve (T₁₂) :-

- Supplies skin below lateral part of inguinal ligament

② Femoral branch of genitofemoral nerve (L_{1,2} → lumbar plexus) :-

- Supplies skin below middle part of inguinal ligament

- (Genital branch supplies cremasteric muscle),

- (it enters thigh behind ^{middle of} inguinal ligament).

③ Ilioinguinal nerve (L₁ → lumbar plexus) :-

- Supplies skin below medial part of inguinal ligament & skin of root of Penis (clitoris) & anterior skin of scrotum (labium ^{major})

- (it enters thigh through superficial inguinal ring).

④ Obturator nerve (L2.3.4 → Lumbar plexus) :- (by ant. division) :-

- Supplies small area over medial aspect of the thigh.

⑤ Lateral cut. N. of thigh (L2.3 → lumbar plexus) :-

- Supplies skin of lateral aspect of thigh & knee, buttock ^(lower lateral)
- (enters thigh behind lateral end of inguinal ligament & divides into anterior & posterior divisions).

⑥ Intermediat cut. N. of thigh :- (from femoral N. L2.3.4) :-

- Supplies anterior aspect of thigh.
- (divides into two branches, joins patellar plexus.

⑦ Medial cut. N. of thigh (femoral N. L2.3.4) :-

- supplies medial aspect of thigh, joins patellar plexus.

⑧ Patellar Plexus

- Lies in front of knee joint, formed by

Lat. cut. N. of thigh
interm. " " " "
Medial " " " "
infrapatellar br. of
saphenous N.

⑨ Posterior cut N. of thigh (S1.2.3 → sacral pl.) :-

- supplies posterior aspect of thigh.
- (enters gluteal region through greater sciatic foramen "GSF" below Piriformis & descends posteromedial to sciatic Nerve up to knee)
- Branches are
 - ① - skin of thigh (posterior aspect) & popliteal fossa.
 - ② - skin of buttock (lower medial quadrant)
 - ③ - skin of scrotum "labium majus in ♀" (posterior aspect)

③ The leg

① Saphenous nerve (femoral N. L2.3.4) :-

- Supplies anteromedial aspect of leg. (also medial border of foot up to base "ball" of big toe). also posteromedial aspect of leg.

② Lateral cut. N. of calf : (common Peroneal N.) :-

- supplies upper part of antero-lateral aspect of leg (the lower part of antero-lateral aspect by superficial Peroneal N.)
- also supplies upper part of postero-lateral aspect of leg.

③ Sural nerve (Tibial nerve) :-

- supplies lower part of postero-lateral aspect of leg (also lateral border of foot up to tip of little toe).

The foot

① Superficial Peroneal N. (Common Peroneal N.) :-

- supplies skin on dorsum of foot & medial side of big toe^(1st toe) and adjacent sides of 2nd, 3rd & 4th toes.

② Deep peroneal N. (Common P. N.) :-

- supplies adjacent sides of 1st & 2nd toes.

③ Saphenous N. (femoral N.) :-

- supplies medial side of foot until head of 1st metatarsal bone^(ball of big toe).

④ Sural N. (tibial N.) :-

- supplies Lateral side of foot & lateral side of little toe^(5th toe).

⑤ Medial Plantar N. (tibial) :-

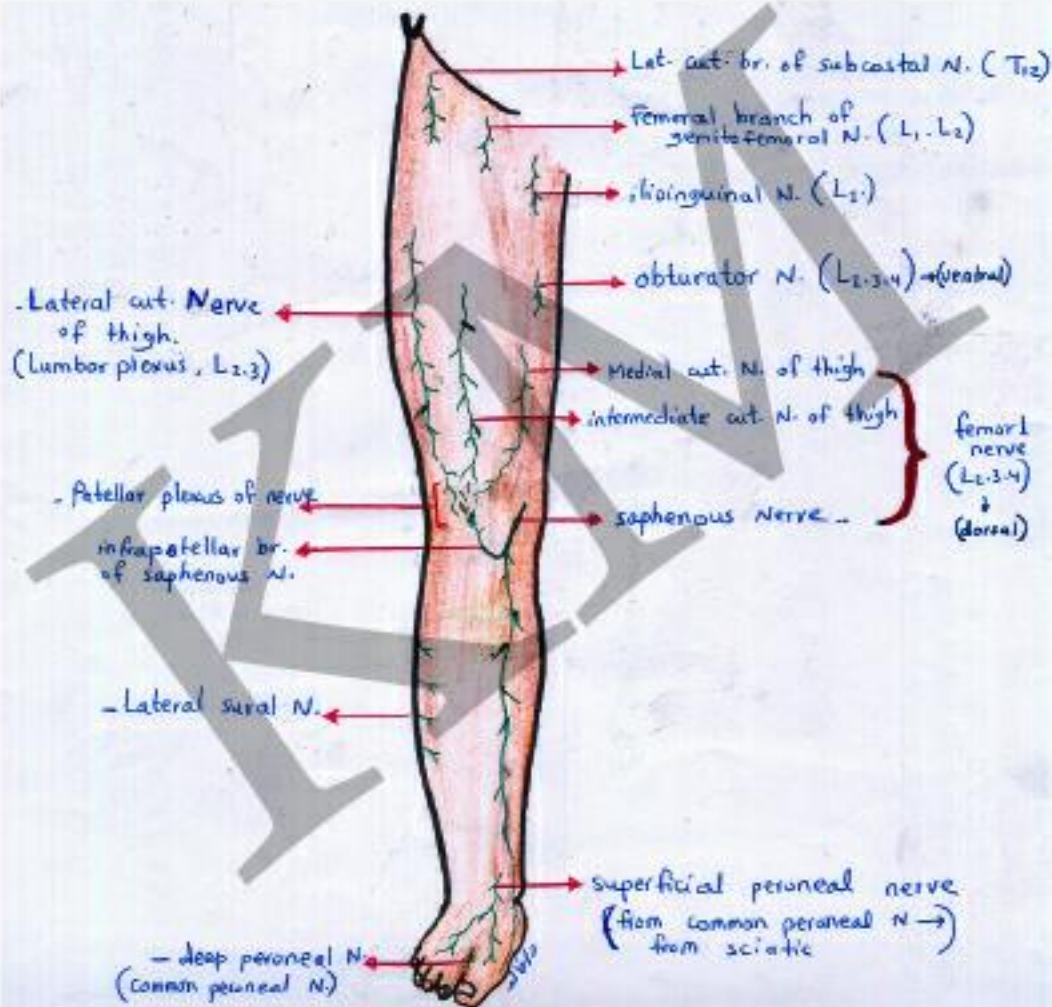
- supplies medial 2/3 of sole & skin of terminal Phalanges of medial 3 and 1/2 toes (dorsally).

⑥ Lateral Plantar N. (tibial) :-

- supplies lateral 1/3 of sole & skin of dorsum of terminal phalanges of lateral 1 & 1/2 toes.

⑦ Medial calcaneal N. (tibial)

- supplies medial side of the heel.



Dorsal rami of upper 3 lumbar

Dorsal rami of upper 3 sacral

Lateral cut. branch
of subcostal N. (T₁₂)

Branches of
lat. cut. N. of thigh.
(L_{2,3})

post. cut. N. of thigh
(sacral plexus)
S_{1-2,3}

Sural N.
(tibial N.)

Lat. cut. N. of the calf
(common peroneal N.)

Sural communicating bran
(common peroneal N.)

Branches of
(saphenous N.)

medial calcaneal N.
(tibial N.)

medial plantar N.
(tibial N.)

Lateral plantar N.
(tibial N.)



SUPERFICIAL VEINS OF LOWER LIMB

(A) Dorsal venous arch:-

- * Site :- over heads of metatarsal bones.
- * Tributaries :- receives digital veins & veins from sole.
- * End :- forming Great & small saphenous veins.

(B) Great saphenous vein :- "Long saphenous V."

- * Beginning :- from medial end of dorsal venous arch.
- * End :- by draining into femoral vein about 4 cm (1.5 inch) below & lateral to pubic tubercle (by passing saphenous opening)
- * Course :- passes in front of medial malleolus & ascends in superf. fascia over medial aspect of leg (accompanied by saphenous N.)
 - Passes behind the knee (joining small saphenous)
 - Curves forward around medial aspect of thigh, passes through saphenous opening piercing cribriform fascia.
 - It has numerous valves & connected with deep veins of lower limb by perforating veins (① at mid of thigh, ② just below knee, ③ above medial malleolus by 5, 10 & 15 cm).

* Tributaries of great saphenous vein :-

- ① - superficial circumflex iliac vein.
- ② - superficial epigastric vein. ~~~~~→ it joins lateral thoracic vein to form thoraco-epigastric vein (joining SVC & IVC)
- ③ - superficial external pudendal vein.
- ④ - accessory vein.
- ⑤ - unnamed veins.

APPLIED anatomy :-

- ① - intravenous infusion (venous cutdown)
- ② - may be used as graft for diseased coronary a
- ③ - if dilated, tortuous called varicose veins.

C- Small saphenous vein "short saph."

* Beginning:- from lateral end of dorsal venous arch.

* End:- by draining into Popliteal vein.

* Course:- Ascend behind lateral malleolus (accompanied by sural N.)

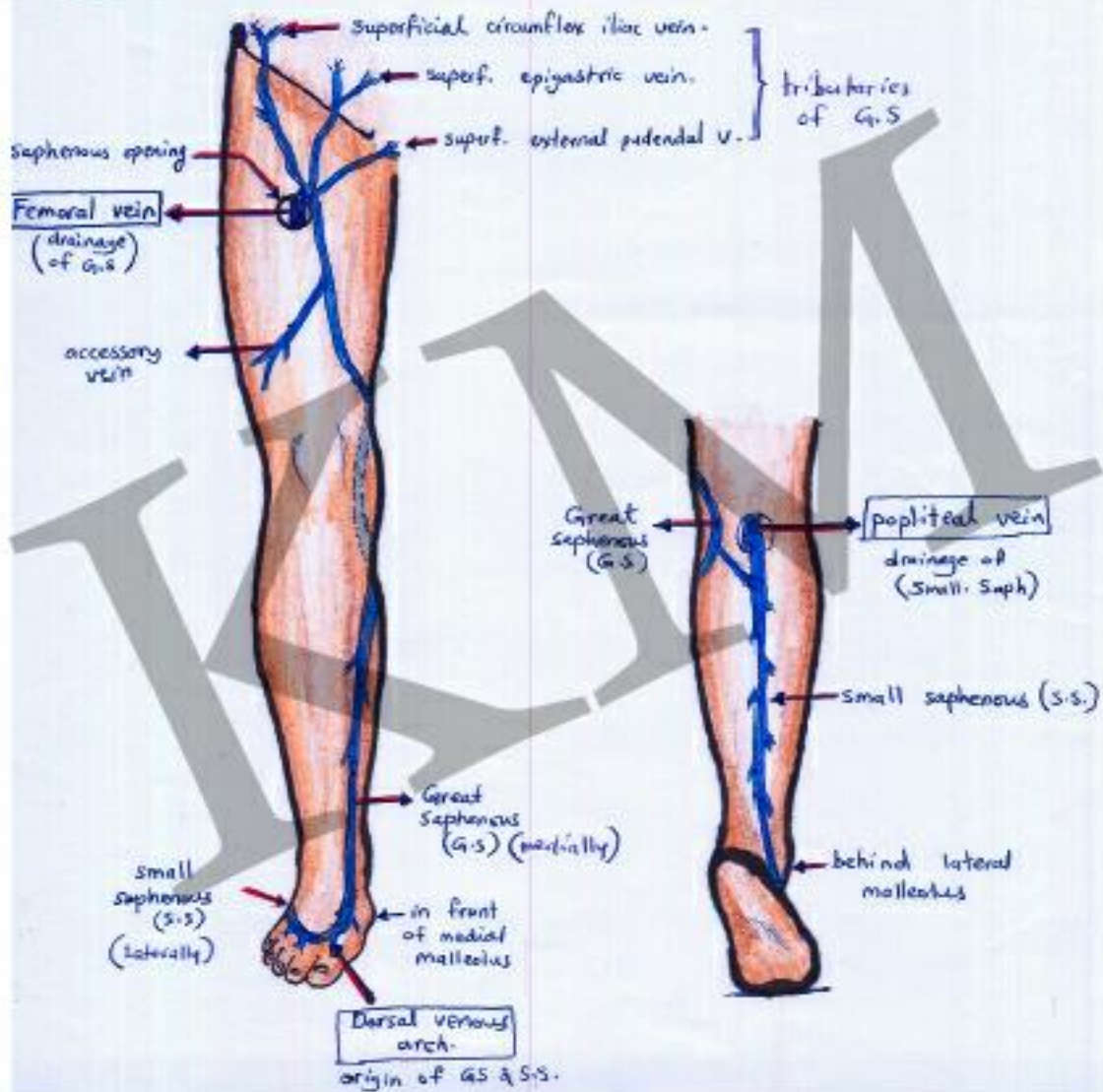
- follows lateral border of tendo-calcaneus.

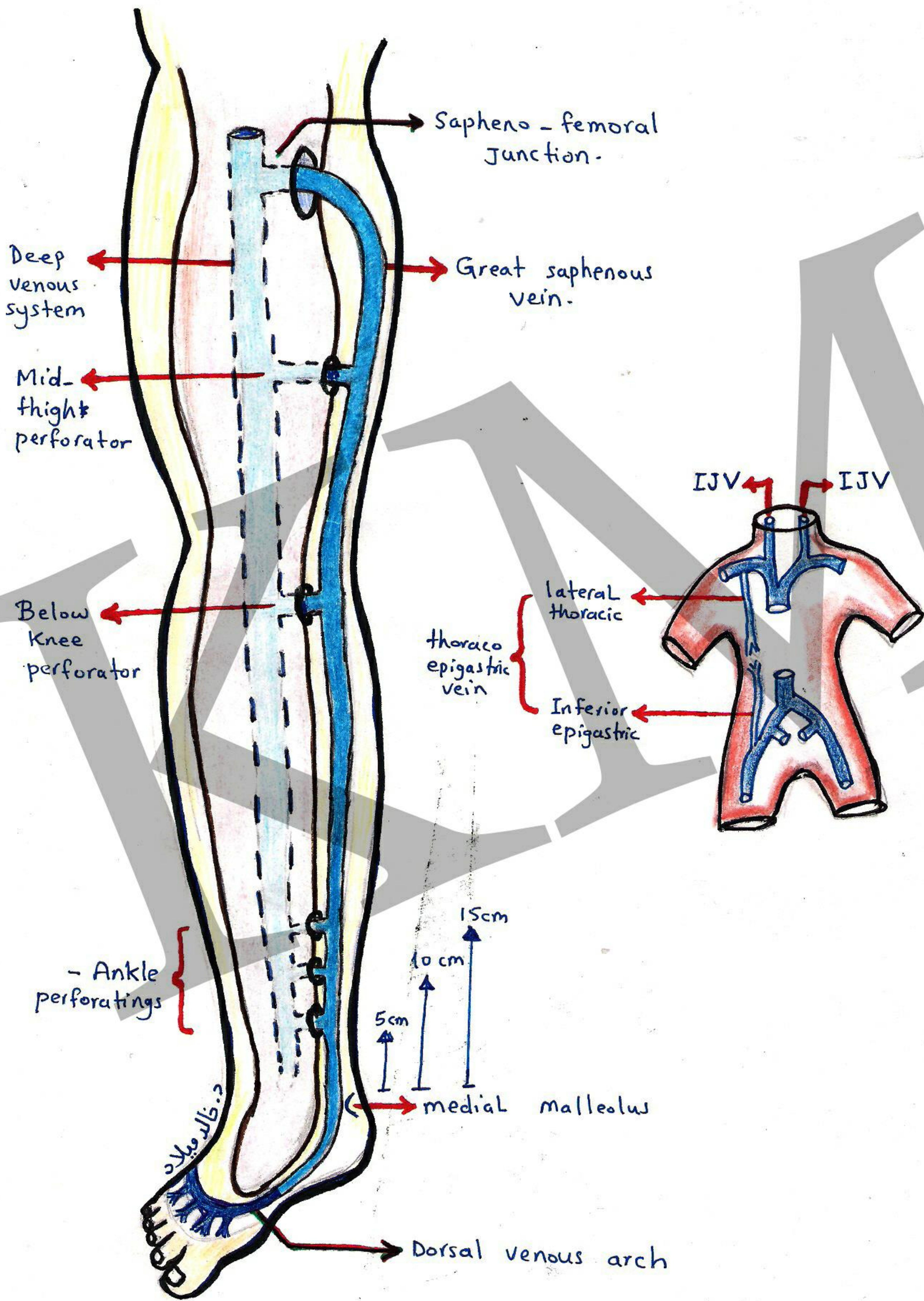
- runs up to middle of back of leg, pierces deep fascia and passes between 2 heads of gastrocnemius in lower part of popliteal fossa.

* Tributaries:- ① small veins from back of leg.

② anastomosing vein with great saphenous vein.

③ communicating veins with foot deep veins.





LYMPHATICS OF LOWER LIMB

"Inguinal Lymph nodes"

(I) - INGUINAL L.N.

A Superficial inguinal L.N. :-

① Horizontal group :-

- Lies below (& Parallel) to inguinal Ligament.
- Divided into :-
 - a Medial members:- receive lymph vessels from
 - anterior abdominal wall below umbilicus.
 - Perineum (urethra, lower $\frac{1}{2}$ of anal canal & external genitalia of both sexes) ^{except testis}
 - b Lateral members:- receive lymph vessels from
 - back below iliac crest.

② Vertical group :-

- Lies along terminal Part of great saphenous vein
- receives Lymph from most of superficial lymphatic of lower limb.

NB:- Efferent lymph vessels from superficial inguinal LN pass through saphenous opening to join deep inguinal LN which pass through femoral canal to join ^{external} iliac Lymph Nodes.

B Deep inguinal L.N. :-

- Lies under fascia lata along medial side of femoral vein
- Efferent: Passes into ext. iliac LN through femoral canal.
- Afferent: from
 - ① superficial inguinal LN.
 - ② most of deep structures of lower limb.
 - ③ efferent from popliteal LN.

II - POPLITEAL L.N. :-

- About 6 Lymph nodes, Lies embedded in fatty C.T of popliteal fossa
- {Afferents from}
 - superficial lymphatic along small saphenous vein
(from lateral side of foot & lateral side of leg & knee)
 - deep lymphatic along anterior & posterior tibial arteries
- {Efferents to} : deep inguinal LN through adductor canal (by accompanying femoral artery)

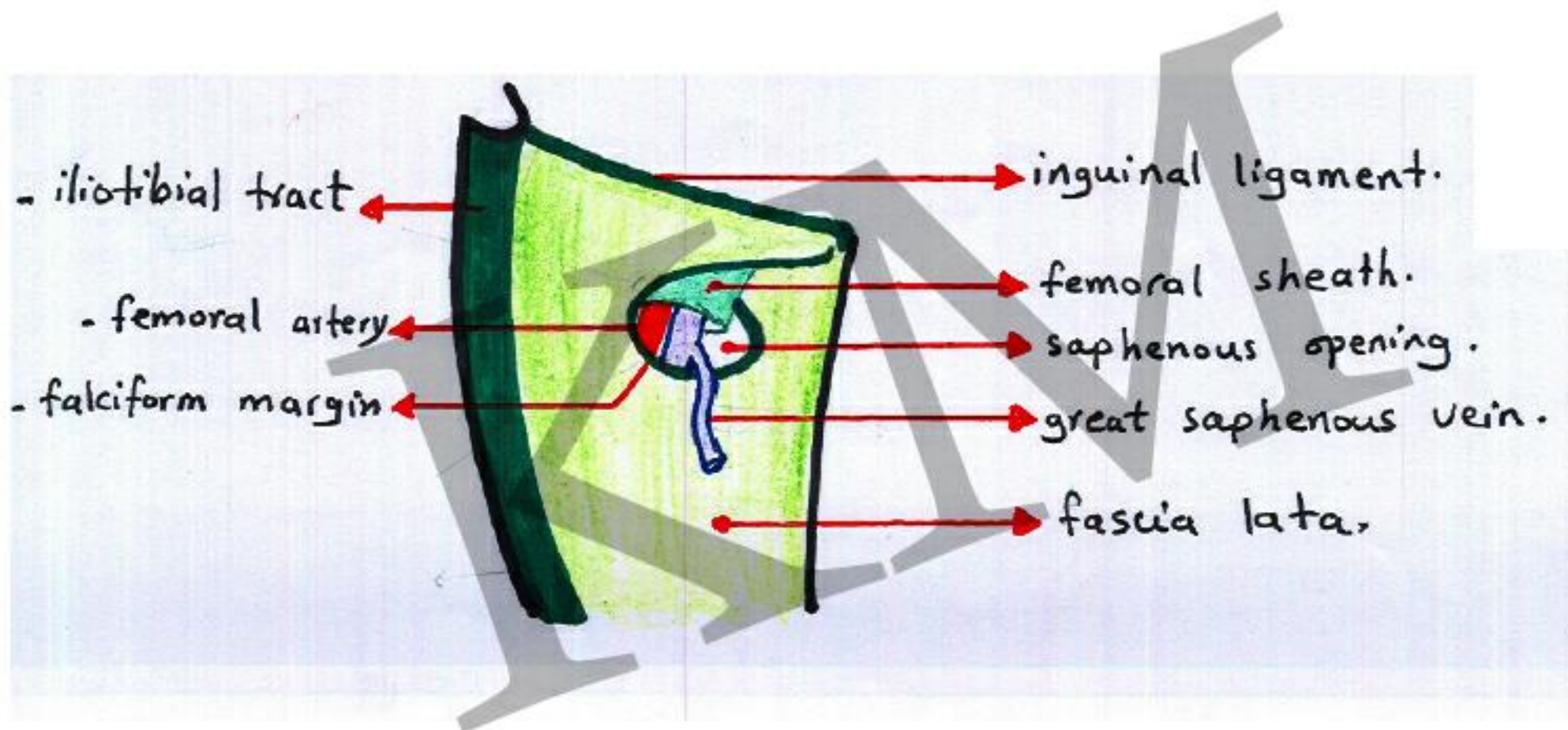
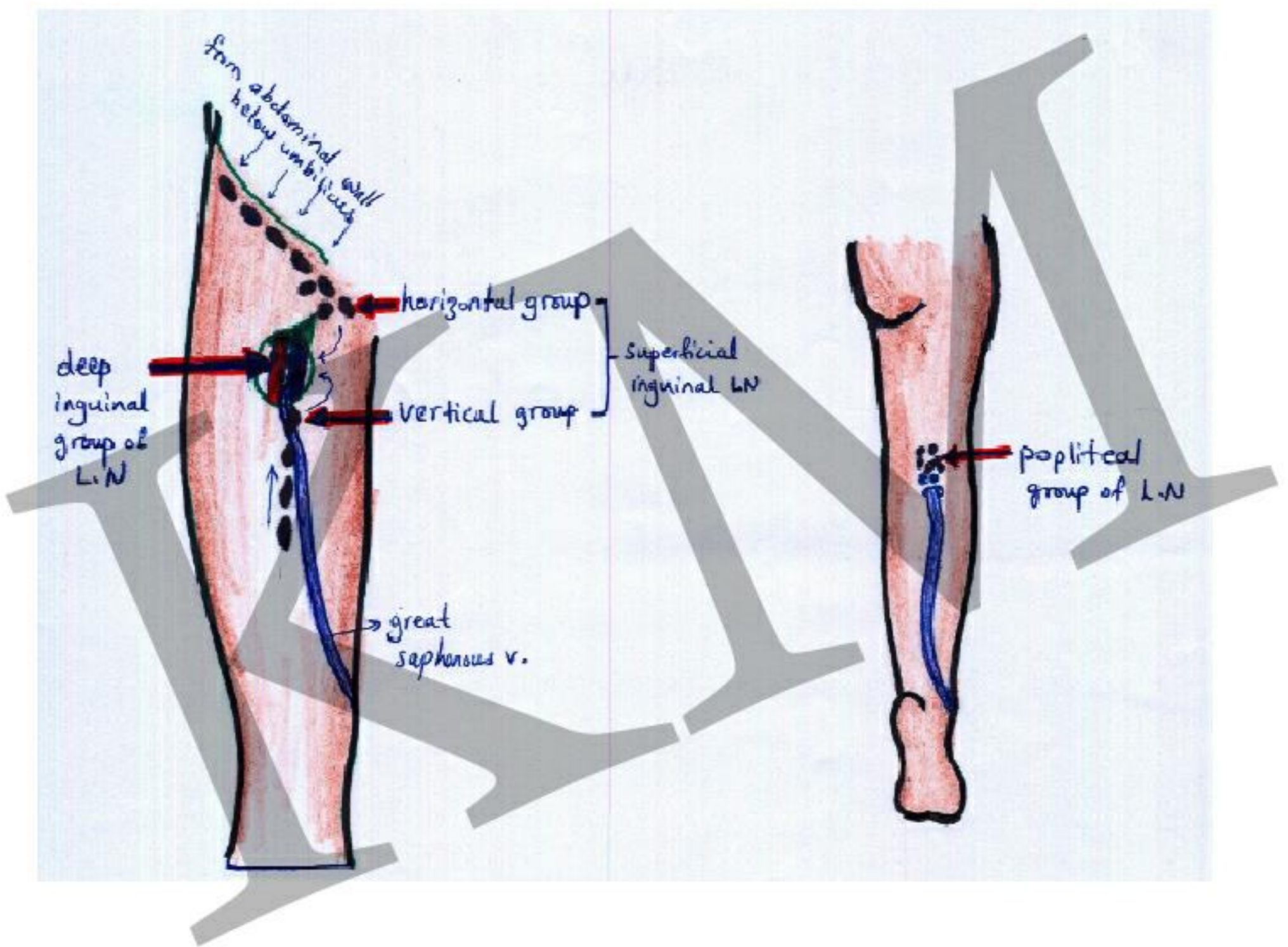
SUPERFICIAL FASCIA OF L.L.

- It is differentiated into ① superficial fatty layer.
- ② Deep membranous layer.
- The two layers are continuation of that of ^{anterior} abdominal wall.
- Contents of superf. fascia :-
 - 1- Veins → great & small saphenous (with tributaries)
 - 2- arteries → the three superficial br. of femoral a
 - 3- Lymph → superficial inguinal LN.
 - 4- Nerves → cutaneous nerves
- The membranous layer is attached with deep fascia of the thigh (fascia lata) along a horizontal line just below inguinal ligament

NB: this fusion prevent the escape of urine to the thigh during injury of urethra.

Buttock :-

- superficial fascia of gluteal region is thick in women with large quantities of fat giving prominence of buttock.



DEEP FASCIA OF LOWER LIMB

I. Thigh "Fascia lata" (lata = broad)

- Attached above to inguinal ligament & hip bones, and below to bony prominences around the knee.
- Thickened laterally to form iliotibial tract.
- At upper medial part perforated by saphenous opening.
- Sends 3 intermuscular septa to linea aspera of femur which divides the thigh into 3 compartments.



* Iliotibial tract :- (1-2 inch wide)

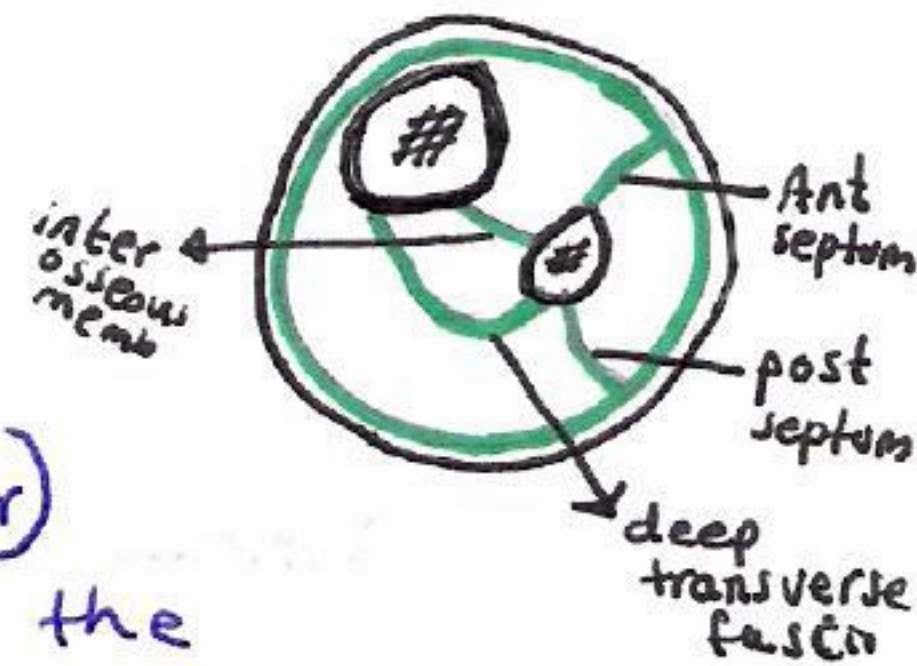
- Thickened band of fascia lata at lateral aspect of thigh.
- Attached above to iliac tubercle (& part of crest) and below to the lateral condyle of tibia (anterolat. aspect)
- It steadies the hip & knee joints during limb extension in erect position
- It gives insertion to ① - Tensor fascia lata.
② - Gluteus maximus (superficial 3/4).

* Saphenous opening :-

- Opening in fascia lata' about 4cm (1½ inch) below & lateral to the pubic tubercle.
 - Covered by cribriform fascia which is perforated by
 - 1-(vein) → great saphenous vein.
 - 2-(lymph) → lymphatics from superficial to deep inguinal LN.
 - 3-(Arteries) →
 - Superficial circumflex iliac artery
 - Superficial epigastric.
 - Superficial external pudendal a
- } from femoral a
- The upper, lateral & lower margins of saphenous opening forms the falciform margin which pass behind femoral vessel to attach to pectineal line

II - LEG :-

- Deep fascia of the leg send 2 intermuscular septa (anterior & posterior) to fibula.
- The 2 septa & interosseous membrane* divide the leg into 3 compartments (anterior, lateral & posterior)
- Thickened in front & back of ankle to form the extensor & flexor retinacula respectively (see later).



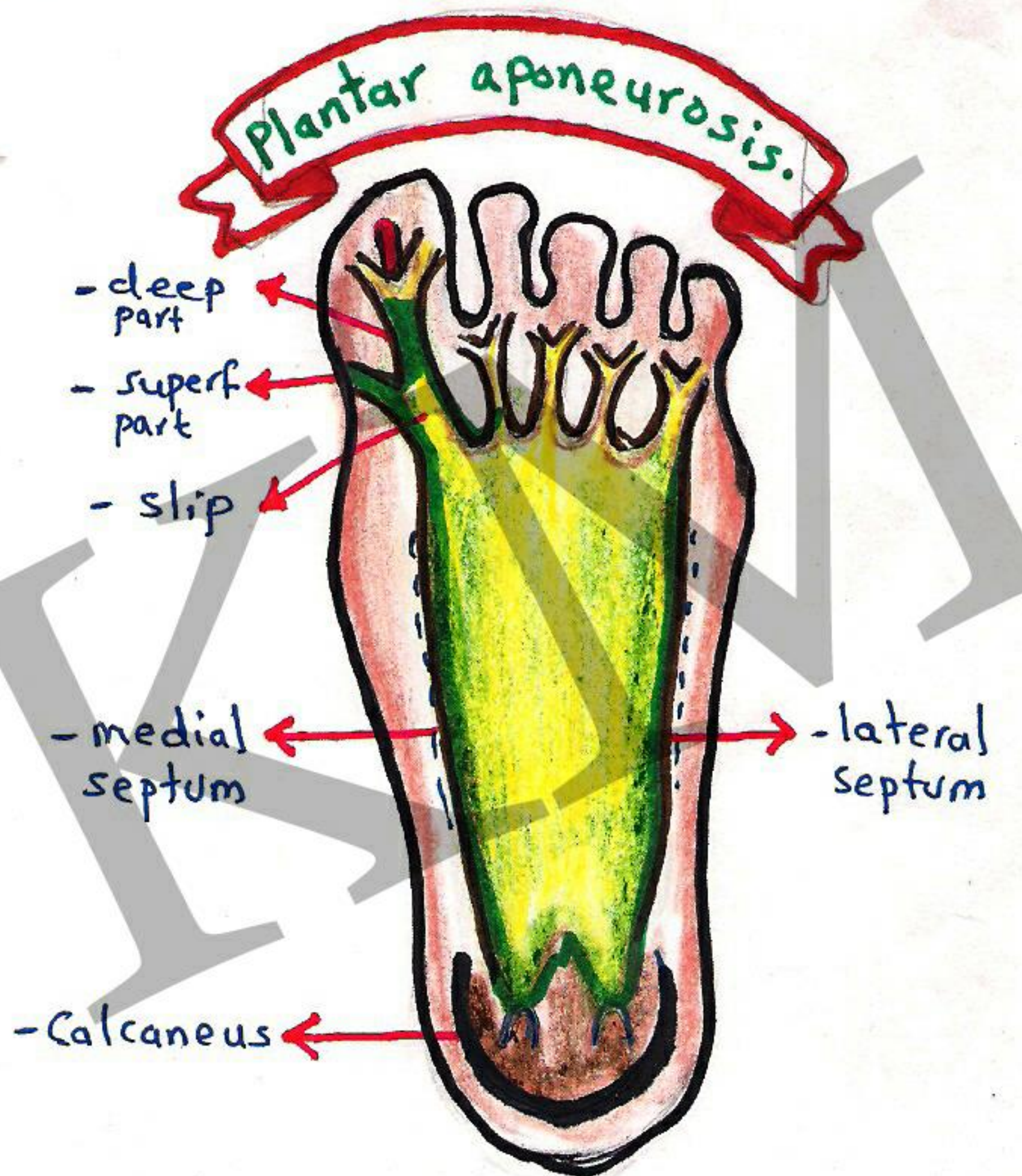
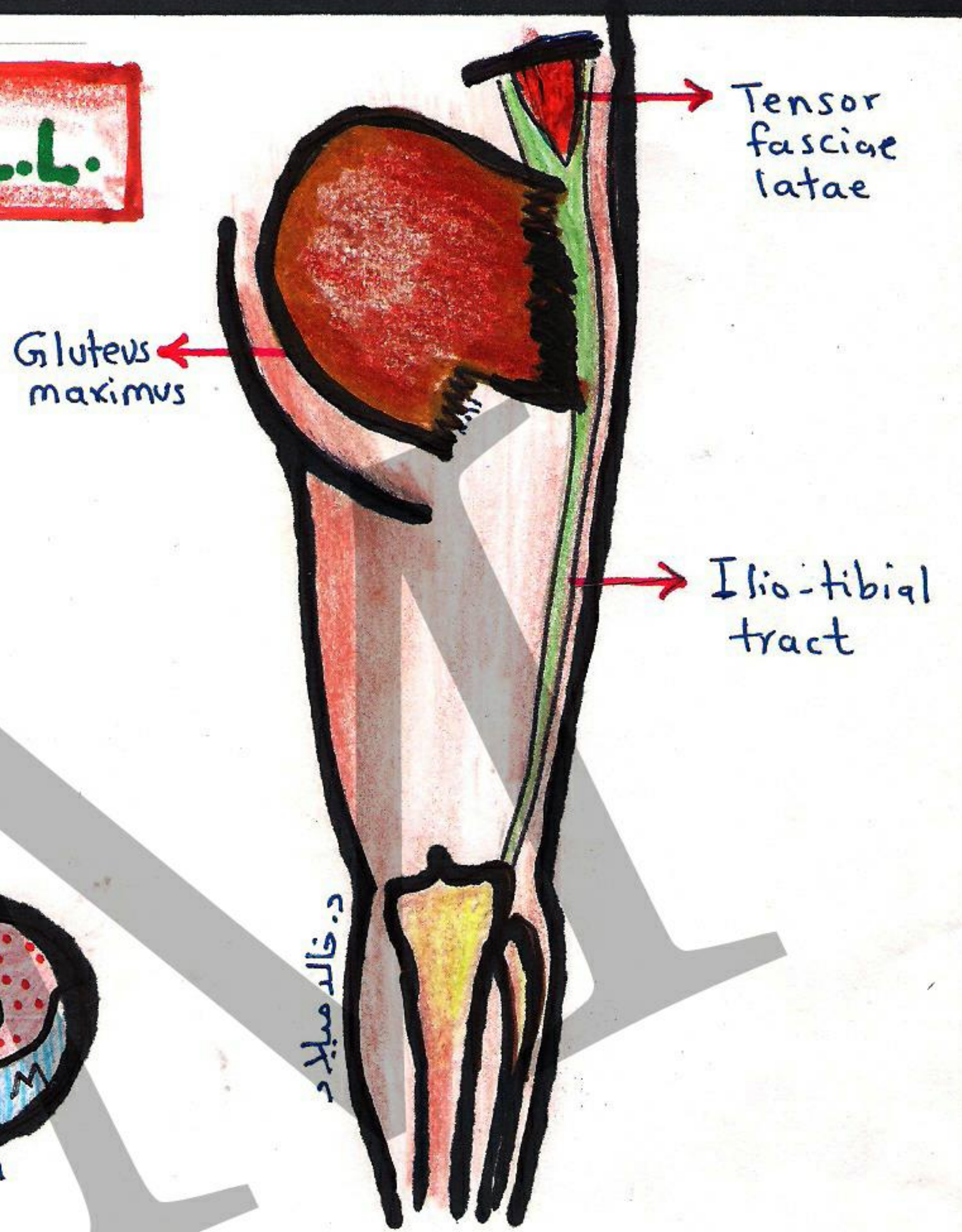
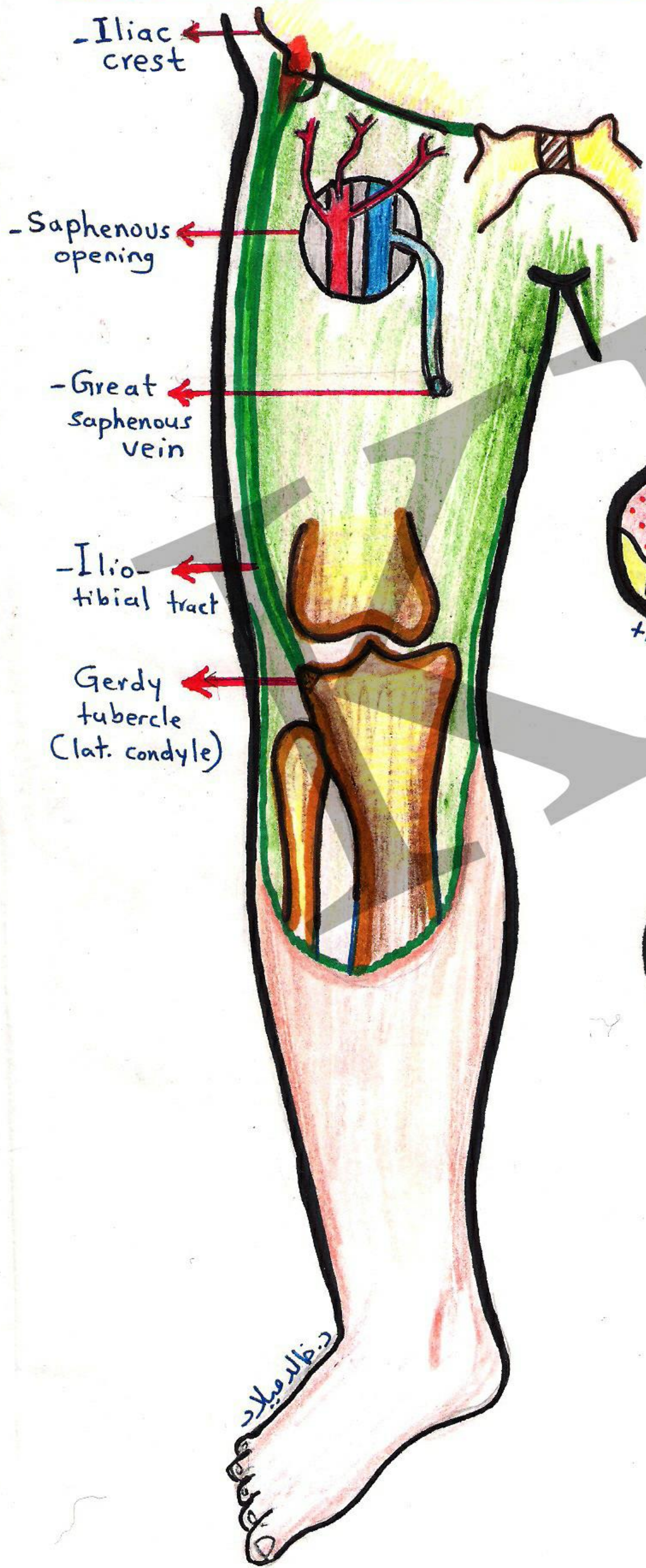
III - FOOT

- Deep fascia thickened in the sole to form Plantar aponeurosis
- Plantar aponeurosis is triangular in shape (with apex & base)
- Apex attached to medial & lateral tubercles of calcaneum.
- base divides at base of toes into 5 slips each slip divided into 2 bands, one passing to the skin & other deep band is divided into 2 parts arounds flexor tendons & fuse with the fibrous flexor sheath & deep transverse ligaments.
- Medial & lateral borders of aponeurosis send fibrous septa into sole forming fascial spaces of the sole.
- Plantar aponeurosis ① Give attachment of overlying skin
② Protect vessels, nerves & tendons of sole.
③ Assist in maintaining the arches of foot.

IV - BUTTOCK

- Continuous below with fascia lata of thigh.
- It splits in gluteal region to enclose gluteus maximus & above gluteus maximus becomes one layer that cover gluteum medius that attached to iliac crest.
- In lateral side forms iliotibial tract.

DEEP FASCIA OF L.L.



FEMORAL TRIANGLE

• Triangular intermuscular space in upper medial $\frac{1}{3}$ of thigh.

* Boundaries :-

- superior (base): inguinal ligament
- Laterally :- Medial border of sartorius.
- Medially :- Medial border of adductor longus.

* Roof (anterior wall) :-

- Skin & superficial fascia (with its contents)
- Deep fascia (lata) with saphenous opening.

* Floor (from Lat. to Medial) :-

- Iliacus, Psoas, pectineus & adductor longus

* Contents :-

- 1-(Nerve) :- Femoral nerve & its branches., Lat. cut. N. of thigh.
 - 2-(Artery) :- Femoral artery & its branches.
 - 3-(vein) :- Femoral vein & its tributaries.
 4. (LN) :- deep inguinal LN.
- Fatty c.T.

* Femoral sheath :-

- Fascia ^{surrounds} covering femoral vessels for about 1 inch below ing. lig.
- Anterior wall is continuation of fascia transversalis ^{ant. abd. wall} while posterior wall is continuation of fascia iliaca. ^{Post abd. wall.}
- Compartments of femoral sheath are
 - Medial → Femoral canal,
 - Intermediate → Femoral vein.
 - Lateral → Femoral artery & Femoral br. of genitofemoral N.

* Femoral canal :-

- Medial compartment of femoral sheath, about $\frac{1}{2}$ inch. ^{→ For expansion of femoral vein.}
- Its upper opening called Femoral ring & closed by Femoral septum.
- Contents are ① Fatty c.T. ② one deep inguinal LN (Cloquet LN).
- ③ efferent lymph vessels from deep ing. LN.

Lower end of canal adheres to tunica adventitia of femoral vein.

*** Femoral ring :-**

- Upper opening of femoral canal, closed by femoral septum (condensation of extraperitoneal tissue).
- Boundaries :-
 - Anterior :- inguinal ligament.
 - Medial :- Lacunar ligament.
 - Posterior :- Pectineal Lig. (& superior ramus of pubis)
 - Lateral :- femoral vein.

*** Femoral hernia :-**

- Protrusion of peritoneum into the femoral canal through the femoral ring (as canal is a weak area in abdomen).
- It is more common in female. due to wide pelvis (wide ring).

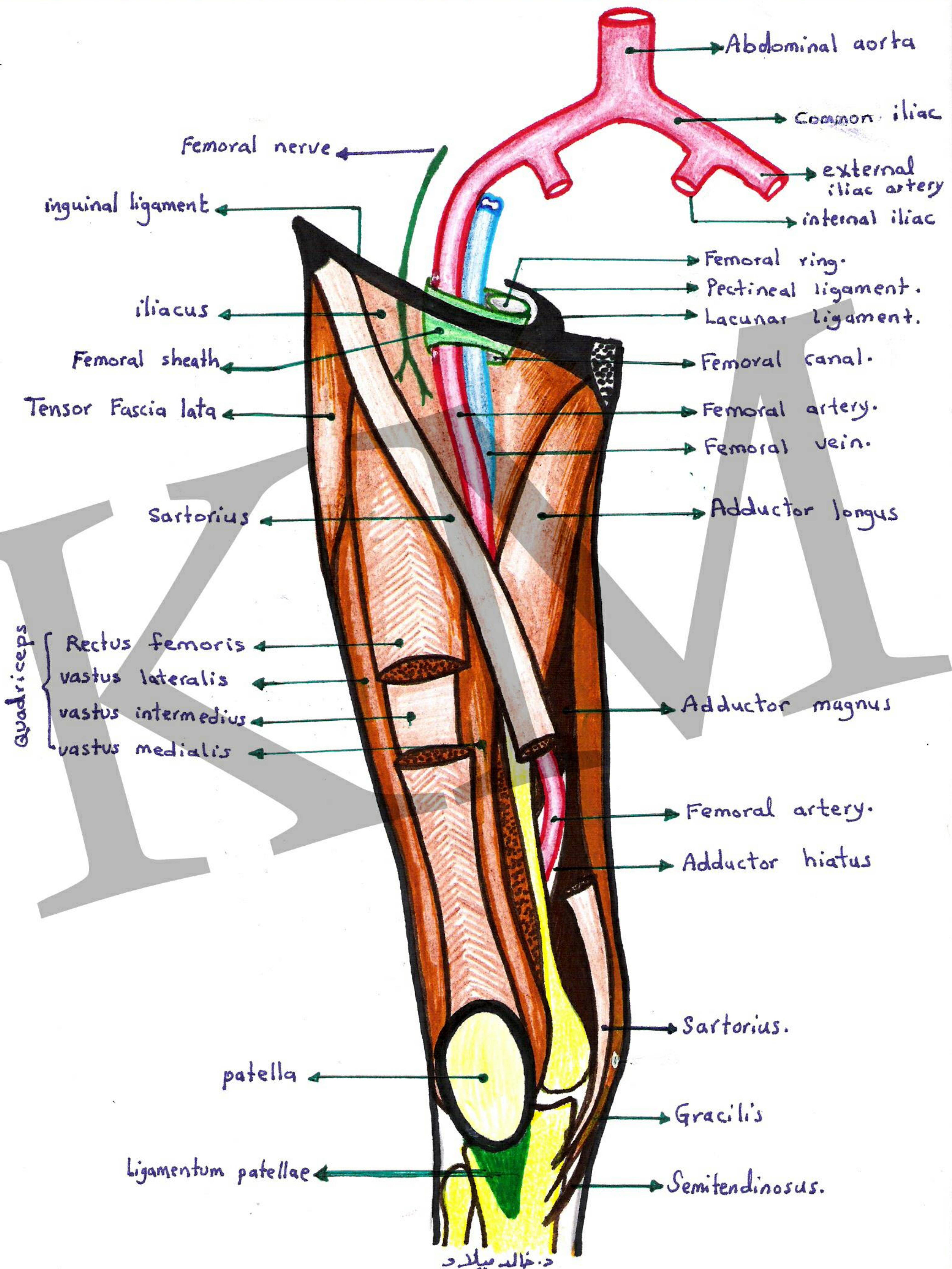
**"Subsartorial ; Hunter's canal"**

- Intermuscular cleft on medial aspect of middle $\frac{1}{3}$ of thigh.
- Begins above at apex of femoral triangle.
- Ends below at adductor hiatus (opening in adductor magnus ms).
- It is triangular in cross section.

- * Boundaries :-**
- Roof (anteromedial) :- sartorius & fascia.
 - Lateral (anterolateral) :- vastus Medialis.
 - Posterior wall :- adductor longus & magnus

- * Contents :-**
- ① (Nerve) :- Saphenous nerve, obturator N. (terminal part) & N. to vastus medialis. subsartorial plexus of nerves
 - ② (Artery) :- femoral artery. (& descending genicular br.)
 - ③ (vein) :- femoral vein.
 - ④ (LN) :- deep lymph vessels (connect popliteal LN. to deep ^{ing.} LN.)

N.B. subsartorial plexus formed ^{deep to fascia lata} inside canal at lower border of add. longus by
 ① saphenous N. ② med. CN. of thigh ③ ant. division of obturator N.
 gives few cut. filaments



POPLITEAL FOSSA

■ Diamond-shaped intermuscular space at back of knee.

* Boundaries :- Superior-lateral :- Biceps femoris.

- Superior-Medial :- Semitendinosus & semimembranosus.

- Infero-lateral :- lateral head of gastrocnemius & Plantaris.

- Infero-Medial :- Medial head of gastrocnemius.

* Floor (deep) (anterior wall) :-

- Popliteal surface of femur.

- Popliteus muscle.

- Posterior ligament (capsule) of knee.

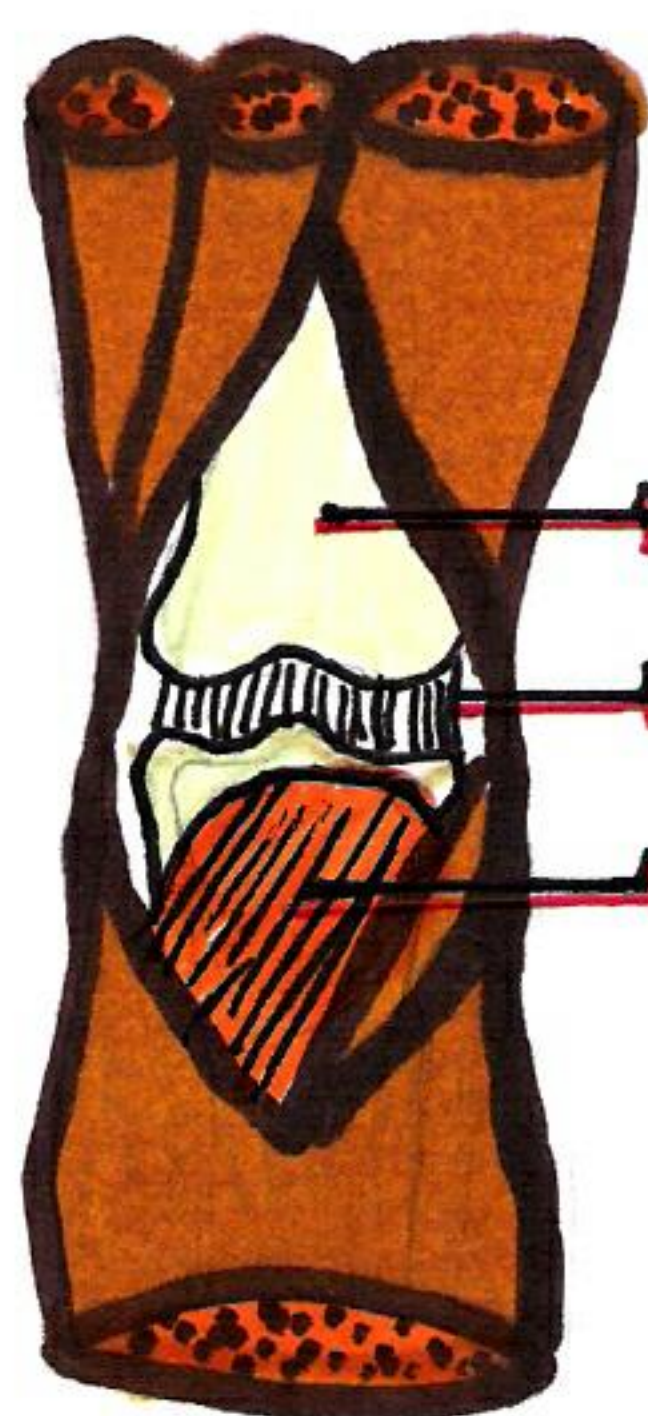
* Roof (superf.) (posterior wall) :-

- Skin.

- Superficial & deep fascia.

* Contents of the fossa

- ① (Nerve) :- Tibial & common peroneal nerves.
+ genicular br. of obturator N.
- ② (Artery) :- Popliteal artery.
- ③ (vein) :- Popliteal vein (with ^{part of} small saphenous vein).
- ④ (LN) :- Popliteal LN.
- ⑤ Fatty connective tissue.



Floor

Popliteal surface of femur
Post. lig. of knee
Popliteus



Contents

Popliteal lymph node

popliteal fat

common peroneal N.

Tibial N.

Popliteal vein.

Popliteal artery

Medial head of gastrocnemius

semitendinosus & semimembranosus

Biceps femoris

Plantaris

Lateral head of gastrocnemius

popliteal fossa

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Popliteal fossa

Rectus femoris

vastus medialis

vastus intermedius

sartorius

vastus lateralis

adductor canal

lateral intermuscular septum.

adductor longus

adductor magnus

Posterior compartment

Medial compartment



THE GLUTEAL REGION

- The gluteal region is bounded superiorly by iliac crest & inferiorly by fold of the buttock.

SKIN :- see skin of lower limb (Page 1) → Buttock

SUPERFICIAL FASCIA :- see (page 7).

DEEP FASCIA :- see (page 9)

LIGAMENTS :- Sacrospinous & Sacrotuberous → see pelvis (Page 5).

FORAMINA :- The greater & lesser sciatic foramina.

- They are formed by conversion of greater & lesser sciatic notches to foramina by sacrospinous & sacrotuberous ligaments.
- GSF (Greater Sciatic Foramen) provides exit from pelvis to gluteal region.
- LSF (lesser S. F.) provides entrance into perineum from gluteal region.

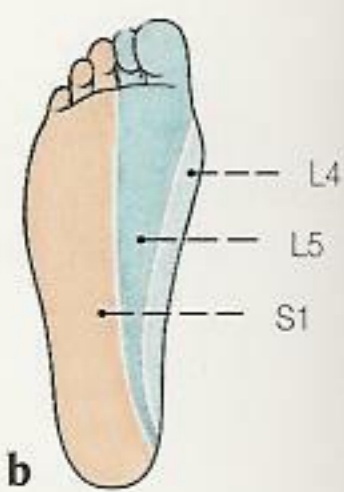
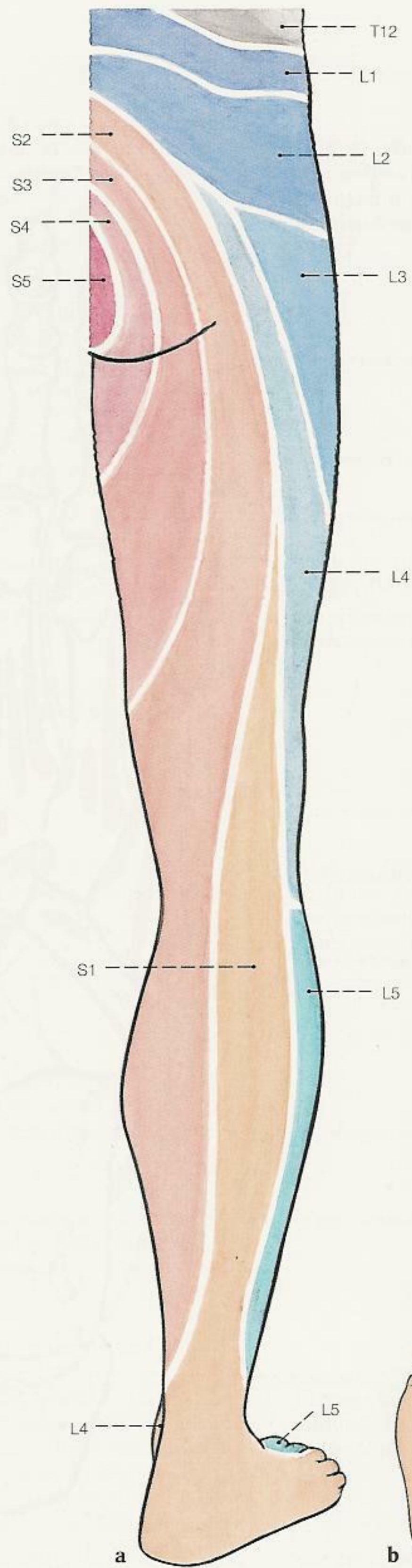
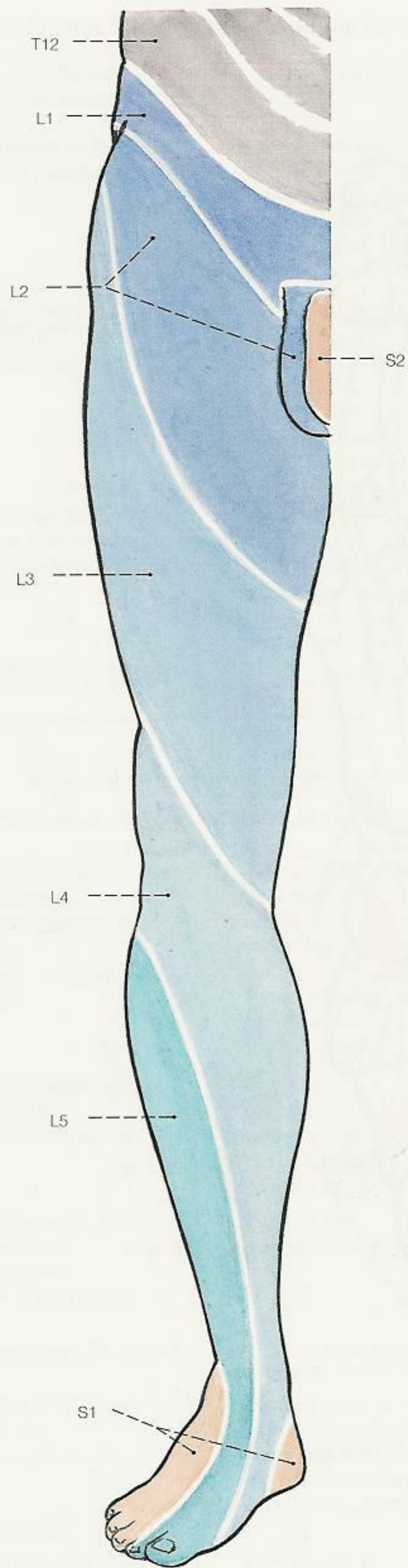
* Structures Passing through GSF :-

- | | |
|-------------------------------------|--------------------------------|
| ① Piriformis | ⑥ pudendal nerve. |
| ② Superior gluteal nerve & vessels. | ⑦ internal pudendal vessels. |
| ③ Inferior gluteal nerve & vessels. | ⑧ Nerve to obturator internus. |
| ④ Sciatic nerve. | ⑨ Nerve to quadratus femoris. |
| ⑤ Posterior cut. Nerve of thigh. | |

→ NB: ② Pass above piriformis but others below it in GSF

* Structures Passing through LSF :-

- ① obturator internus.
- ② pudendal nerve.
- ③ internal pudendal vessels.
- ④ Nerve to obturator internus.



NERVES OF GLUTEAL REGION

[1] Sciatic Nerve :- see nerves of lower limb.

[2] Posterior cutaneous N. of thigh :-

- branch of sacral plexus (S₁₋₂₋₃)
- Enters gluteal region through greater sciatic foramen below Piriformis
Passes downward on posterior aspect of sciatic N. deep to the gluteus maximus then superficial to biceps femoris deep to fascia lata & in popliteal fossa pierces deep fascia.
- Branches are cutaneous to
 - Gluteal br. to lower medial 1/4 of buttock
 - Perineal br to back of scrotum (or labium majus)
 - Skin of back of thigh, Popliteal upper leg.

[3] Inferior gluteal Nerve :- (L₅. S₁ S₂) sacral plexus.

- leaves pelvis through GSF below Piriformis close to Post. cut. N. of thigh.
- Ends by supplying gluteus maximus.

[4] Superior gluteal Nerve :- (L₄. S. S₁) sacral plexus.

- leaves pelvis through GSF above Piriformis.
- runs between Gluteus medius & minimus supplying them & tensor fascia lata

[5] Nerve to quadratus femoris :- (L₄. S. S₁) sacral plexus.

- leaves pelvis through GSF below Piriformis
- runs deep to sciatic N., sup. & inf. gemelli & tendon of obturator internus.
- supplies quadratus femoris & inferior gemellus.

[6] Nerve to obturator internus :- (L₅. S₁. S₂) sacral plexus.

- leaves pelvis through GSF below Piriformis
- crosses ischial spine & reenter pelvis through lesser sciatic foramen
- supplies obturator internus & superior gemellus.

[7] Pudendal nerve :- (S₂₋₃₋₄) sacral plexus.

- leaves pelvis through GSF below Piriformis
- crosses ischial spine & reenter pelvis through LSF

ARTERIES OF LOWER L.

2007

I. FEMORAL A.

**** Beginning :-** at inguinal ligament as a continuation of external iliac artery. at midinguinal point.

**** End :-** at adductor hiatus by becoming popliteal artery

**** Course :-** Enters the thigh behind inguinal lig. inside the femoral sheath (at midinguinal point).

Then enters the femoral triangle & leaves the apex of triangle entering into adductor canal where it ends at adductor hiatus becoming popliteal artery

" it descends vertical toward adductor tubercle of femur.

**** Relation :-** in the femoral Δ — lateral $\rightarrow$ femoral nerve.

Medial $\rightarrow$ femoral vein.

anterior $\rightarrow$ skin & fascia.

posterior $\rightarrow$ Psoas & pectineus.

- in adductor canal — anteromedial $\rightarrow$ Sartorius.

antero lateral $\rightarrow$ vastus medialis.

posteriorly $\rightarrow$ add. longus & magnus.

(A) $\rightarrow$ L.S.M

N.B :- the femoral a descends first lateral to femoral vein (at femoral sheath) then in superficial front of the vein (at apex of femoral Δ) then finally medial to the vein (at adductor hiatus).

(V) $\rightarrow$ L.D.M

N.B :- so the femoral vein ascends first lateral to artery (at add. hiatus) the deep posterior to artery (at apex of femoral Δ) the finally medial to artery (at femoral sheath)

** Branches of femoral artery :

- ① Superficial circumflex iliac a. → (runs toward ASIS).
- ② Superficial epigastric a. → (runs toward umbilicus).
- ③ Superficial external pudendal a. → (supply scrotum or labium majus).
- ④ Deep external pudendal a. → (supply scrotum or labium majus).
- ⑤ Profunda femoris a.
- ⑥ Descending genicular a (the last br.) → (supply knee joint)

PROFUNDA FEMORIS A. :-

- **Beginning** :- It is the largest br. of femoral artery from Lateral border [4 cm below inguinal lig.].
- **End** :- ends by becoming the 4th perforating branch.
- **Course** :- Arise from Lateral border of femoral a then passes medially behind the artery [between pectineus & add. longus]
 - enters medial compartment & sends 4 perforating branches to the posterior compartment.
- **Branches** :-
 - ① Medial circumflex femoral a — gives
 - ascending br.
 - transverse br.
 - acetabular br.
 - ② Lateral circumflex femoral a — gives
 - ascending br.
 - transverse br.
 - descending br.
 - ③ three perforating branches.
 - ④ Ends as the fourth perforating branch.

N.B :- Head of femur (HOF) is supplied by :-

- ① artery of Ligament of HOF (Lig. teres)
- ② acetabular branches of — medial circumflex a
 - obturator a (post. division).

II. OBTURATOR A.

- **Beginning** :- branch of internal iliac artery. (anterior division).
- **End** :- by dividing into anterior & post. divisions.
- **Course** :- Enters the thigh (with obturator N.) through the obturator canal to medial compartment of thigh
- **Branches** :-
 - ① visceral :- to urinary bladder.
 - ② Muscular :- to neighboring muscles.
 - ③ Articular: to hip joint (enters into Lig. of head of femur (Ligamentum teres) to supply head of femur)
 - ④ Pubic branch :-

N.B - the pubic br. anastomose with the pubic branch of inferior epigastric artery (which replace obturator artery in 30% of people & descend in free margin of lacunar lig. → this is dangerous during operation of femoral hernia.)

* OBTURATOR VEIN:

- drains into internal iliac vein. & receives tributaries that corresponds to branches of the artery.

* FEMORAL VEIN:

- Starts at add. hiatus as continuation of popliteal vein &
- Ends at femoral sheath (ing. Lig.) becoming external iliac vein.
- Tributaries are
 - ① great saphenous vein.
 - ② Deep external pudendal vein.
 - ③ Descending genicular vein.
 - ④ Medial & lateral circumflex femoral veins.
 - ⑤ Profund femoris vein.

III - POPLITEAL A:

• **Beginning**:- at add. hiatus as continuation of femoral a.

• **End**:- at lower border of popliteus muscle by dividing into anterior & posterior tibial arteries.

• **Course**:- descends in popliteal fossa: first medial to popliteal vein then deep to it & finally lateral to the vein

(A) → M. D. L

(V) → M. S. L

So the popliteal vein ascend in the fossa first medial to artery then superficial & finally lateral to the popliteal artery (always between the a & tibial nerve)

• **Relation**:- anterior (from above downward):

- ① popliteal surface of femur.
- ② knee joint.
- ③ popliteus ms.

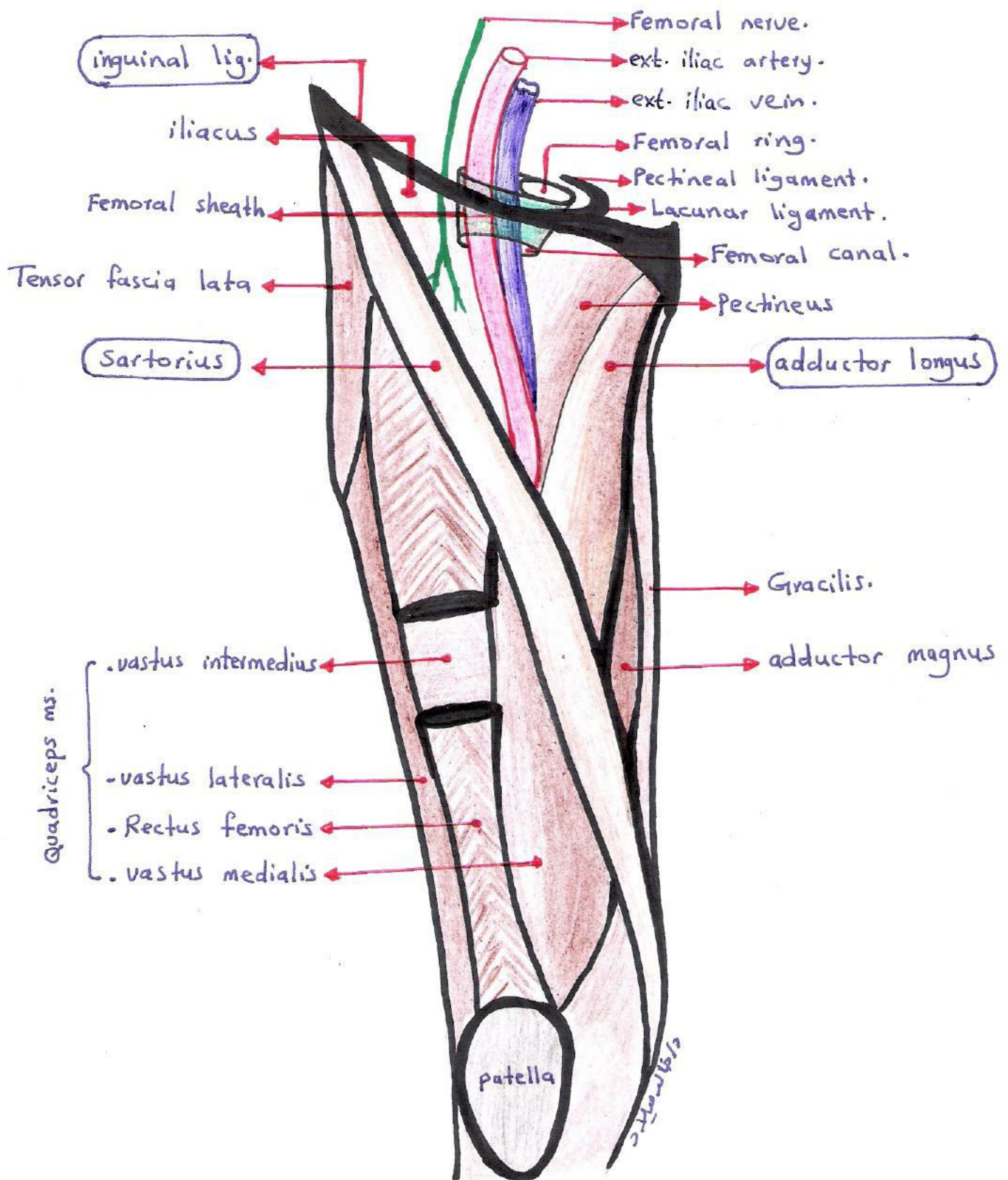
• posterior (from superficial to deep):

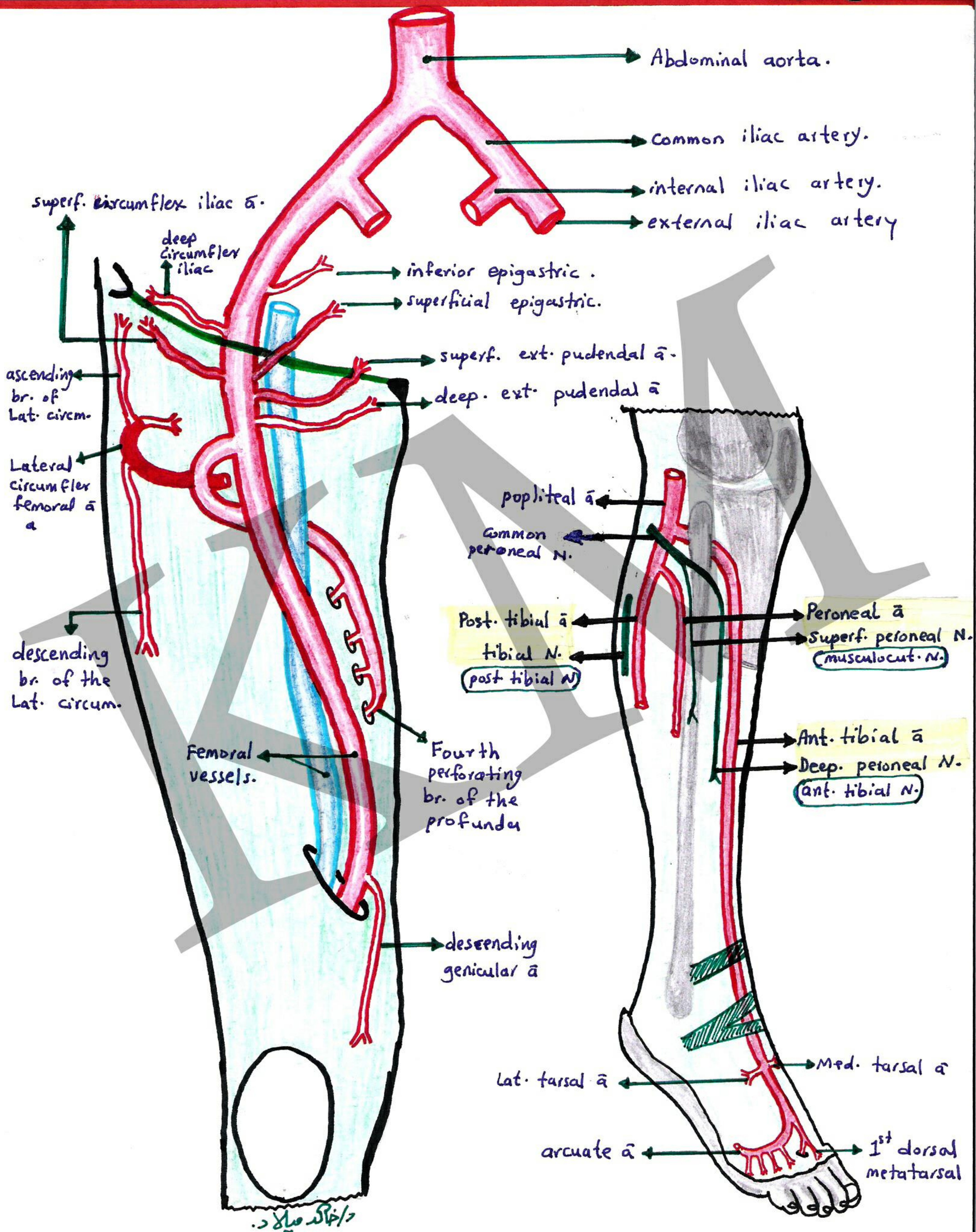
- ① skin & fascia.
- ② tibial nerve.
- ③ popliteal vein.

• **Branches**:- the branches are:-

- ① Muscular:- to muscles beside.
- ② anterior & posterior tibial arteries (terminal br.).
- ③ Middle genicular artery.
- ④ Superior medial genicular a.
- ⑤ " Lateral " "
- ⑥ inferior medial " "
- ⑦ " Lateral " "

N.B:- the popliteal vein start at lower border of popliteus by union of vena comitantes of ant & post. tibial arteries
 - end at add. hiatus becoming femoral vein.
 - receive tributaries as br. of the artery + small saphenous v.





IV - ANTERIOR TIBIAL A.

- **Beginning:** The smaller terminal br. of popliteal artery at the lower border of popliteus ms.
- **End:** Continues as dorsalis pedis artery in front of ankle.
- **Course:**
 - enters the ant. compart. of leg through opening in the upper part of interosseous membrane.
 - running down with deep peroneal nerve.
 - leaves the leg by passing deep to superior extensor retinaculum [between ext. hallucis longus → medially & deep peroneal N. & ext. digitorum longus → Laterally], here the artery is superficial & can be palpable.
- **Branches:**
 - ① Muscular: to muscles beside it.
 - ② Nutrient: to the bones.
 - ③ Anterior & posterior tibial recurrent arteries.
 - ④ Medial & lateral Malleolar arteries.

N.B - Continues as dorsalis pedis artery.

DORSALIS PEDIS A.

- **Beginning:** continuation of anterior tibial artery in front of ankle.
- **End:** in the sole of foot between 1st & 2nd toes to join the plantar arch.
- **Course:** descend in dorsum of foot just lateral & parallel to tendon of extensor hallucis longus between big & second toes.
- **Branches:**
 - ① Medial & lateral tarsal arteries.
 - ② First plantar ^{& Dorsal} metatarsal artery → gives digital to big toe & medial side of second toe.
 - ③ arcuate artery: → gives 4 metatarsal arteries → gives digital branches to lateral 3 and ½ fingers.

V POSTERIOR TIBIAL A.

- **Beginning**: The larger terminal br. of popliteal artery at the lower border of popliteus muscle.
- **End**: By dividing into medial & lateral plantar arteries behind medial malleolus (deep to flexor retinaculum).
- **Course**: Enters the post. compart. of leg between [soleus & gastrocn.] above it & [tibia & tibialis posterior ms] below it.
 - M
↓
S
↓
L
 - Running with tibial nerve [then nerve first medial then superficial & finally lateral to artery].
 - In the lower part of leg is superficial covered only by skin & Fascia (in front of medial border of tendocalcaneus)
- **Branches**:
 - ① Muscular :- to muscles beside.
 - ② Nutrient :- to tibia.
 - ③ Peroneal artery & communicating br. to peroneal a.
 - ④ Medial malleolar.
 - ⑤ Medial calcaneal.
 - ⑥ Medial plantar
 - ⑦ Lateral plantar } terminal.
 - ⑧ Circumflex fibular.

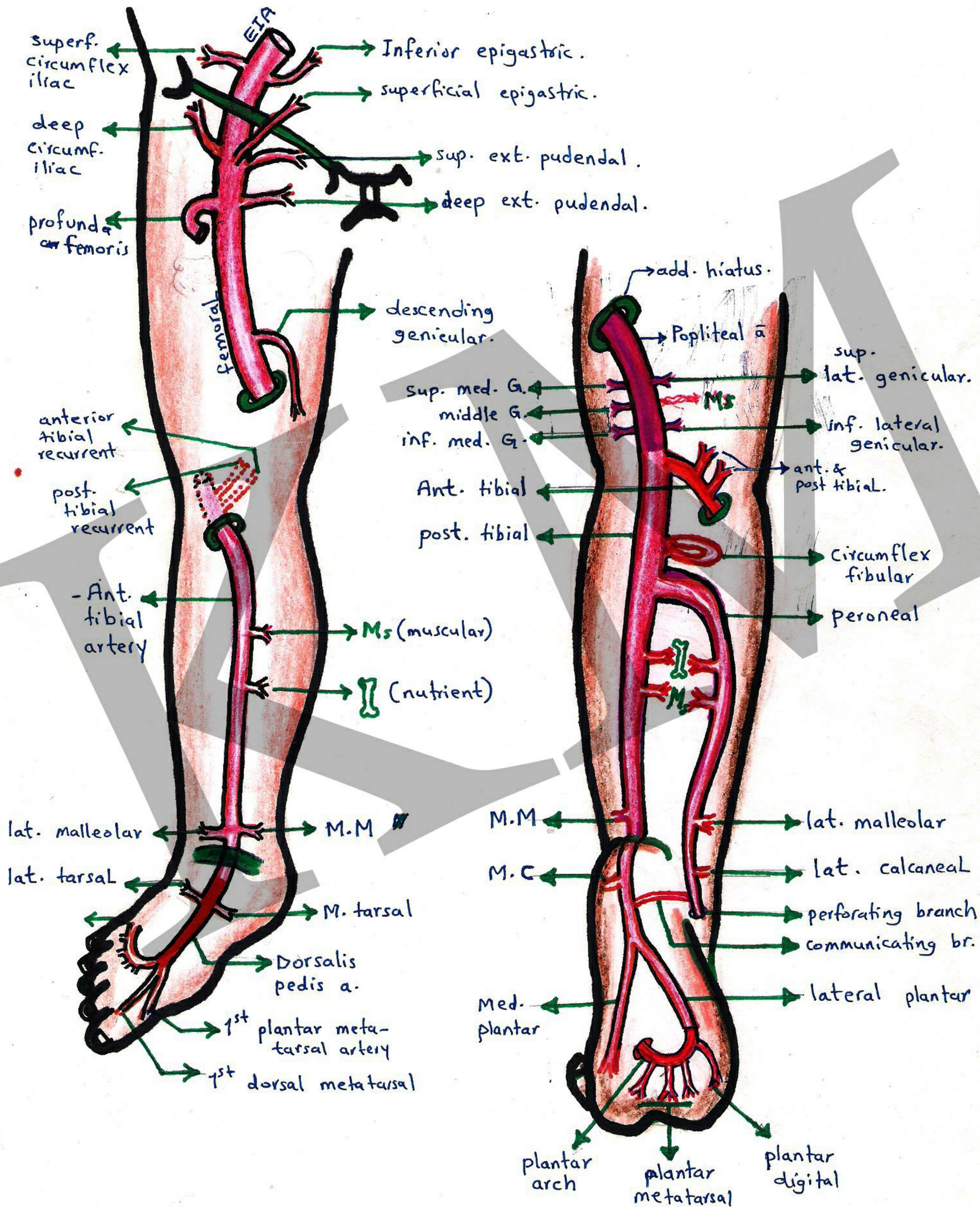
PERONEAL A.

- **Beginning**: from Posterior tibial artery
- **End**: behind inferior tibiofibular joint dividing into calcaneal br.
- **Course**: running in Lat. comp. with superficial peroneal nerve.
- **Branches**:

① Muscular br.	② Nutrient: to fibula.
③ Lateral malleolar	④ Lateral calcaneal.
⑤ Perforating branch.	⑥ Communicating br. to posterior tibial a
↓	
joint Lat tarsal br. of dorsalis pedis	

ARTERIES OF LOWER LIMB

د. خالد ميلاد



ANASTOMOSIS OF LOWER L. 2007

I. TROCHANTRIC ANAS.:

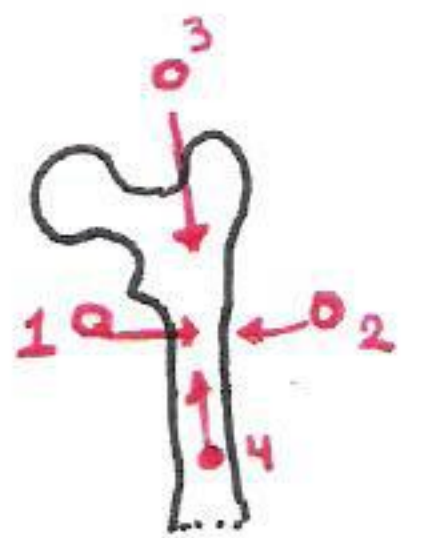
* It is formed by branches of :-

- ① Superior gluteal ā. → [From internal iliac ā (post. division)]
 - ② inferior gluteal ā. → [from internal iliac ā (ant. division)]
 - ③ Medial circumflex ā
 - ④ Lateral circumflex ā
- } → from profunda femoris (femoral ā).

II. CRUCIATE ANAST.:

* It is formed at level of lesser trochanter by :-

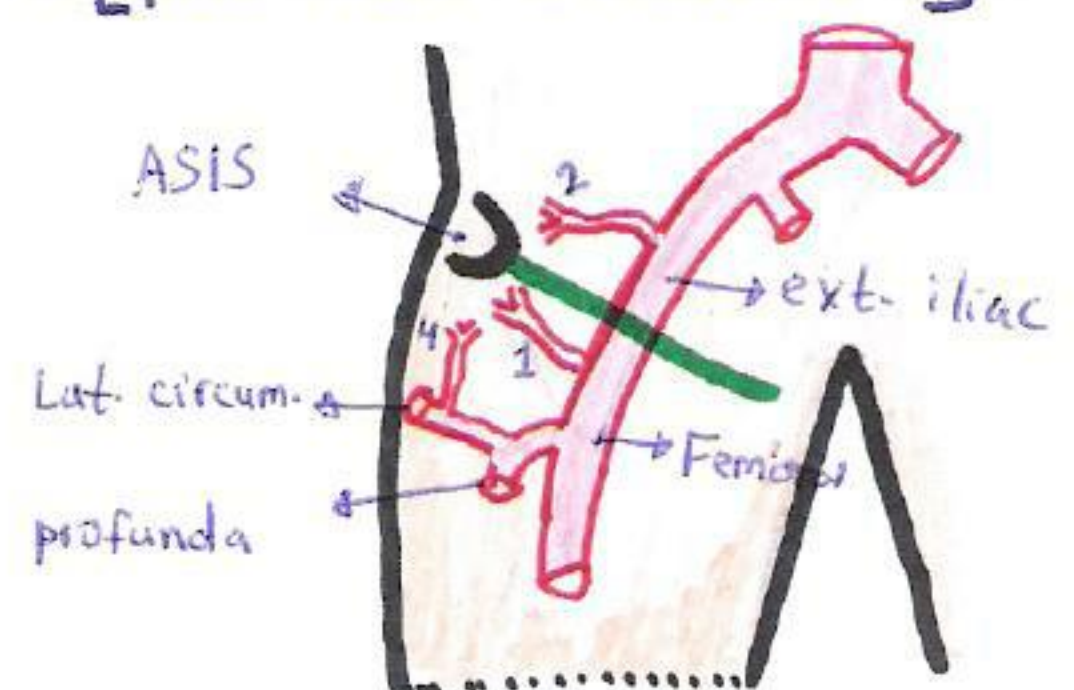
- ① Transverse br. of medial circumflex ā.
- ② Transverse br. of lateral circumflex ā.
- ③ Descending br. of inferior gluteal ā.
- ④ Ascending br. of 1st perforating br. of profunda femoris



III. AROUND ASIS.:

* anastomosis around anterior superior iliac spine by :-

- ① Superficial circumflex iliac ā. → [femoral ā].
- ② Deep circumflex iliac ā. → [external iliac ā].
- ③ Superior gluteal artery → [internal iliac ā].
- ④ Ascending br. of Lateral circumflex ā → [profunda → femoral ā].



IV - AROUND KNEE :

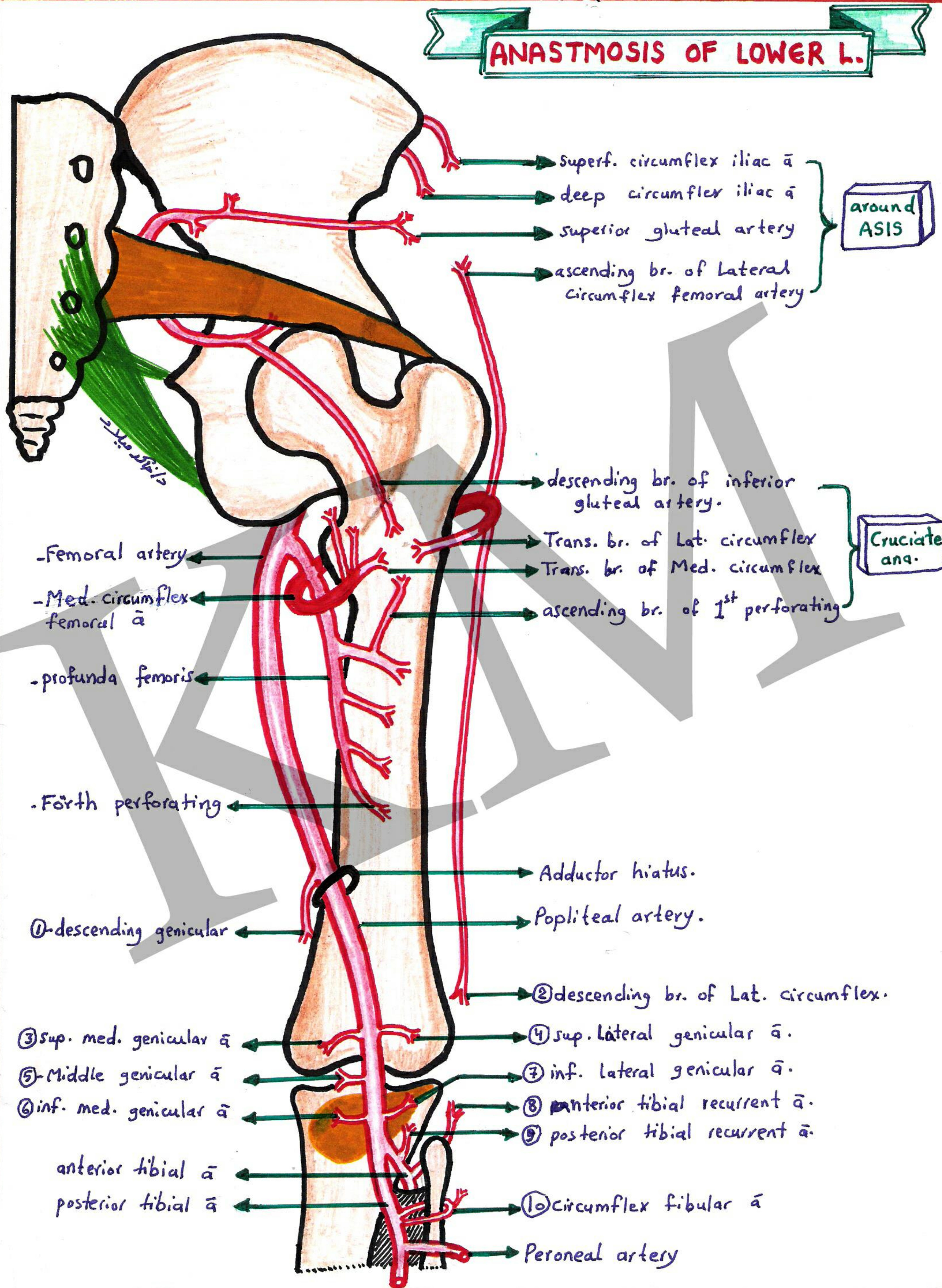
* It is formed by :-

- ① Descending genicular artery
 - ② descending br. of lateral circumflex → profunda
 - ③ Middle genicular artery
 - ④ Superior medial genicular a
 - ⑤ Superior lateral " "
 - ⑥ inferior medial " "
 - ⑦ inferior lateral " "
 - ⑧ Anterior tibial recurrent a
 - ⑨ Posterior " " "
 - ⑩ Circumflex fibular artery
- Femoral a.
- From popliteal a.
- anterior tibial a.
- posterior tibial a.

N.B. - Trochantric anastomosis provides main blood supply to the neck of femur

- Trochantric + cruciate anastomosis provides connection between internal iliac & femoral arteries
- after ligation of femoral artery above profunda femoris artery the collateral circulation is by cruciate & anastomosis around ASIS.

ANASTOMOSIS OF LOWER L.



NERVES OF LOWER LIMB 2007

I FEMORAL N.

****Beginning**:- from lumbar plexus (L2.3.4) - (dorsal divisions). → largest branch.

****End**:- By dividing into anterior & posterior divisions after 4 cm (1½ inch) below inguinal ligament.

****Course**:- Enters the thigh behind inguinal lig. at the lateral border of psoas major (between it & iliacus).
- It descends in femoral triangle, outside femoral sheath

****Branches**:- **[A] from anterior divisions:-**

① Muscular(2):- to Sartorius & pectineus.

② Cutaneous(2):- Medial & intermediate cut. N. of thigh.
+ vasomotor br. to femoral artery

[B] from posterior division:-

① Muscular(1):- to quadriceps ms.

② Cutaneous(1):- Saphenous nerve.

③ Articular(2):- articular br. to knee & hip joints.

N.B → femoral N. supplies iliacus ms. inside abdomen.

Saphenous N:-

- It is a branch of posterior division of femoral nerve.

- Leaves the femoral triangle & enters into adductor canal medial to femoral artery behind sartorius

- becomes superficial & descends at medial side of knee & leg → Passing between sartorius & gracilis.
→ accompanied by great saphenous vein up to medial border of foot (up to the ball of big toe). in front of medial malleolus.

N.B → Subsartorial plexus of nerve:- is formed by branches of:-

- ① saphenous N.
- ② obturator N. (ant. division) and
- ③ Medial cut. N. of thigh.

II - OBTURATOR N.

**** Beginning** :- from lumbar plexus - (L2.3.4) - (ventral divisions).

**** End** :- By dividing into anterior & posterior division by adductor brevis ms. in medial compartment of thigh.

**** Course** :- Enters the thigh through obturator canal at the medial border of psoas major.

**** Branches** :- [A] from anterior division :

① articular :- to hip joint.

② Muscular (3) :- to adductor longus, brevis & gracilis.
occasionally the pectineus

③ Cutaneous :- to medial side of skin of thigh.
• contribute to subsartorial plexus
 • vasomotor to femoral artery

[B] - from posterior division :-

① articular :- to knee joint. "passing through add. hiatus"

② Muscular ($1\frac{1}{2}$) - to obturator externus & $\frac{1}{2}$ of adductor magnus (pubic part).
occasionally add. brevis
 • vasomotor to popliteal a.

III - SCIATIC NERVE

**** Beginning** - from sacral plexus (L4.5. S1.2.3) - (the largest nerve in body).

**** End** :- By dividing into 2 terminal branches

① tibial N. (medial popliteal N.).

② Common peroneal N. (Lateral popliteal N.)

- It ends most commonly at lower $\frac{1}{3}$ of thigh
 (but may divide at $\frac{1}{2}$ of thigh & some times divided from the pelvis)

- It consists of tibial portion & common peroneal portion connected by fascia (connective tissue).

**** Course of sciatic N:** - leaves the pelvis and enters the gluteal region through greater sciatic foramen below piriformis muscle

- It lies on the following from above downward → ischial spine, sup. gemellus, obt. internus, inf. gemellus, quadratus femoris & adductor magnus (sciatic bed)^{ant. relation}
- It related posteriorly to post. cut. N. of thigh & the gluteus maximus, biceps femoris & semimembranosus.
- It leaves the gluteal by passing deep to biceps (long head) & descends in the middle of thigh above adductor magnus (ischial part ^{or} hamstring part).
- It ends by dividing into 2 terminal branches.

**** Branches of sciatic N:**

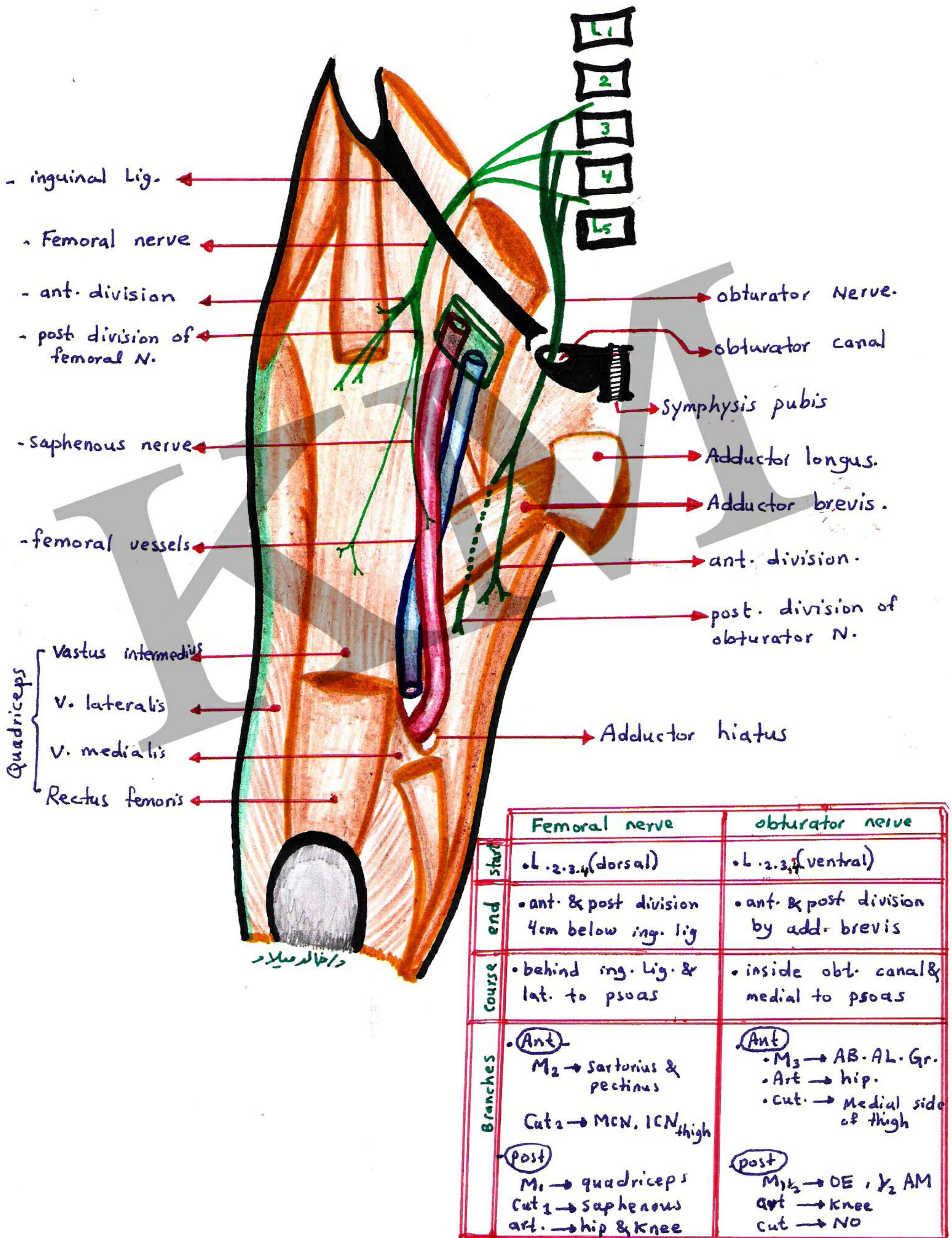
- ① Tibial nerve
- ② Common peroneal N.
- ③ Muscular branches: - to the muscles of post. compart. of thigh through tibial portion (except short head of biceps by common peroneal portion of sciatic).
- ④ Articular :- to hip & knee (by tibial & common peroneal respectively)
(by tibial)

ST. SM. biceps (long head)
add. magnus (hamstring part)

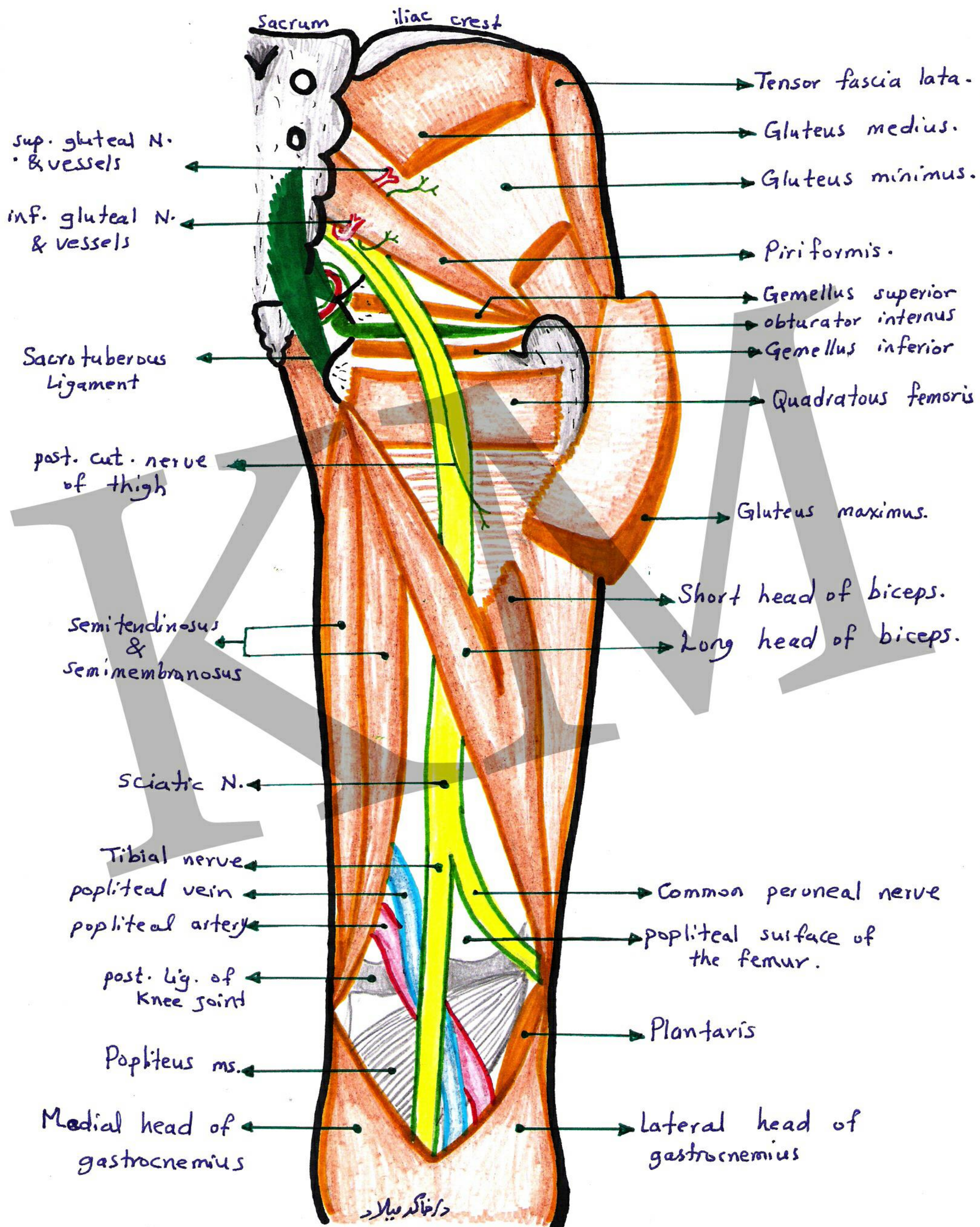
- Surface anatomy of the sciatic N :- in the lower medial quadrant of gluteal region then middle of thigh (post).
- Surface anatomy of the femoral N :- at midpoint of inguinal Lig. (between ASIS & pubic tubercle).
- Surface anatomy of the femoral artery :- at mid inguinal point i.e. (between ASIS & symphysis pubis), passing toward adductor tubercle.

N.B :- the safest site for intramuscular injection is the upper lateral quadrant of gluteal region.

" FEMORAL & OBTURATOR NERVES "



BACK OF THIGH + GLUTEAL REGION



IV. TIBIAL NERVE:

• **Beginning**: The larger terminal br. of sciatic nerve.

(anterior divisions of L_{4,5}. S_{1,2,3})

• **End**: In plantar surface by dividing into medial & lateral plantar nerves (terminal branches).

• **Course**: • In popliteal fossa: ((called **medial popliteal N.**))

- enters the fossa from upper angle & leaves it from the lower angle running with popliteal artery [first Lateral then superficial & finally medial to the artery].

L
↓
S
↓
M

- always the popliteal vein separates the artery from tibial N.

• In the leg: ((called **Posterior tibial N.**)).

- enters the leg (post. compartment) between [soleus & gastrocnemius] above it & [tibia & tibialis posterior ms] below it.

M
↓
S
↓
L

- running with posterior tibial artery [the nerve first medial then superficial & finally Lateral to the artery].

- leaves the leg by passing deep to flexor retinaculum with artery (between Flexor Digit. longus & Flexor Hallucis longus). (TDVNH)

• **Branches**: In popliteal fossa:

① Muscular: Popliteus, gastrocnemius, soleus & plantaris

② Cutaneous: Sural N. (skin of calf, foot - lateral border & little toe)

③ Articular: Knee joint → by $\begin{matrix} \text{sup. medial genicular N.} \\ \text{middle " " "} \\ \text{inf. media " " "} \end{matrix}$ $\downarrow$ Lat. side

In the leg:

① Muscular: Tibialis posterior, F. digit. longus, F. hallucis longus, Soleus

② Cutaneous: medial calcaneal, medial & lateral plantar N.

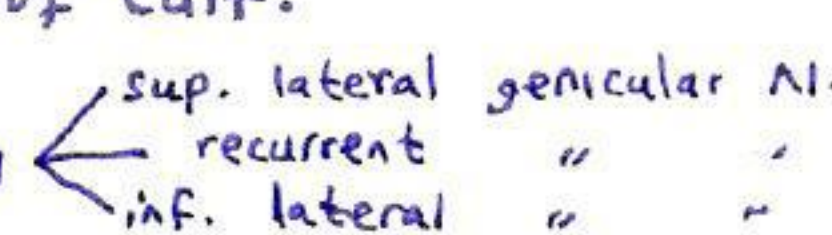
③ Articular: ankle joint.

N.B: terminal branches are: medial & Lateral plantar nerve.

- Sural N. descends between 2 heads of gastrocnemius

- Sural N. accompanied by small saphenous vein behind medial malleolus.

V - COMMON PERONEAL N.

- **Begining**: The smaller terminal br. of sciatic nerve
(Posterior divisions of L₄₋₅. S_{1-2,3}). (called Lat. Popliteal N)
 - **End** :- Inside peroneus longus Lateral to neck of fibula by dividing into ① superficial peroneal N. (musculocutaneous N.) & ② Deep peroneal N. (Anterior tibial N.).
 - **Course** :- enters the popliteal fossa from upper angle &
- leaves the fossa from lateral angle following medial border of biceps femoris above gastrocnemius.
- Passes behind head of fibula & rounds around the neck of fibula (subcutaneous → can be palpable)
 - **Branches**: ① Muscular :- short head of biceps femoris.
② Cutaneous :- Sural communicating br → joins the sural N.
- Lateral cut. N. of calf.
③ Articular :- Knee joint. by 
 - sup. lateral genicular N.
 - recurrent "
 - inf. lateral "
- N.B :- Terminal branches are superficial & deep peroneal Nerves.

VI - SUPERFICIAL PERONEAL N.

- **Begining** : Terminal br. of common peroneal inside peroneus longus.
- **End** : Piercing deep fascia & becomes cutaneous nerve at lower part of leg dividing into medial & lateral branches.
- **Course** :- running with peroneal artery.
- running in lateral compartment between peroneus longus & brevis.
- **Branches**: ① Muscular :- to peroneus longus & brevis.
② Cutaneous :- to skin at dorsum of foot & all toes [except adjacent sides between 1st & 2nd by deep peroneal & lateral side of little toe by sural N.]

VII DEEP PERONEAL N.

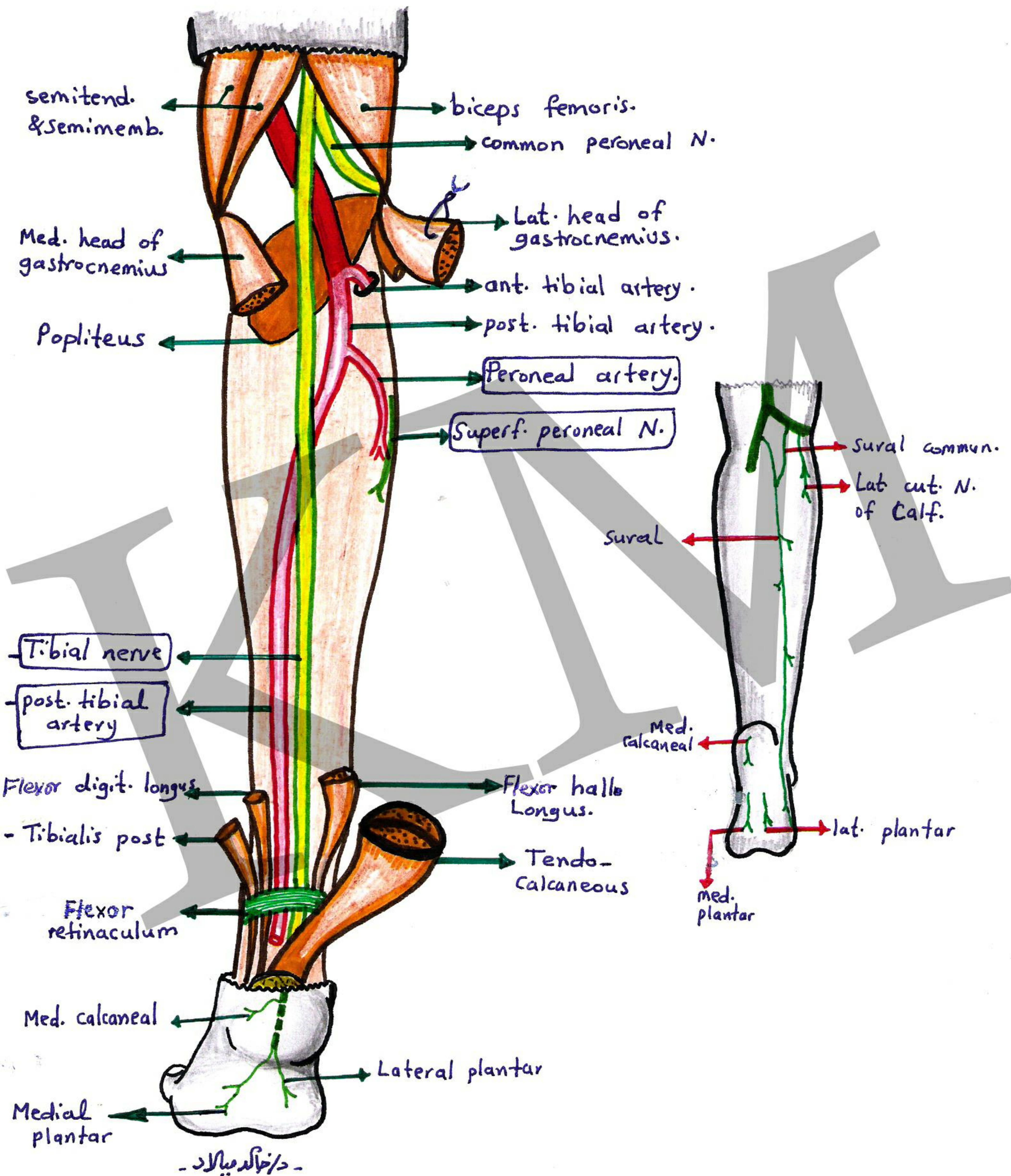
- **Beginning**: Terminal br. of common. Peroneal inside Peroneus longus.
- **End**: by dividing into medial & lateral branches at dorsum of foot after passing deep to extensor retinaculum on lateral side of dorsalis pedis artery.
- **Course**: - enters anterior compart. of leg by piercing anterior fascial septum then deep to extensor digitorum.
 L
 ↓
 S
 ↓
 L
 - running with anterior tibial artery [the nerve is first Lateral, then superficial & finally lateral to a.]
- **Branches**: ① Muscular: Tibialis anterior, Peroneus tertius, ext. digitorum longus & ext. hallucis longus. (extensor digitorum brevis by Lateral br.)
 ② Cutaneous: - to adjacent sides of 1st & 2nd toes (by Medial branch of the nerve).
 ③ Articular: - to ankle & joints of foot.

↳ by deep peroneal N.

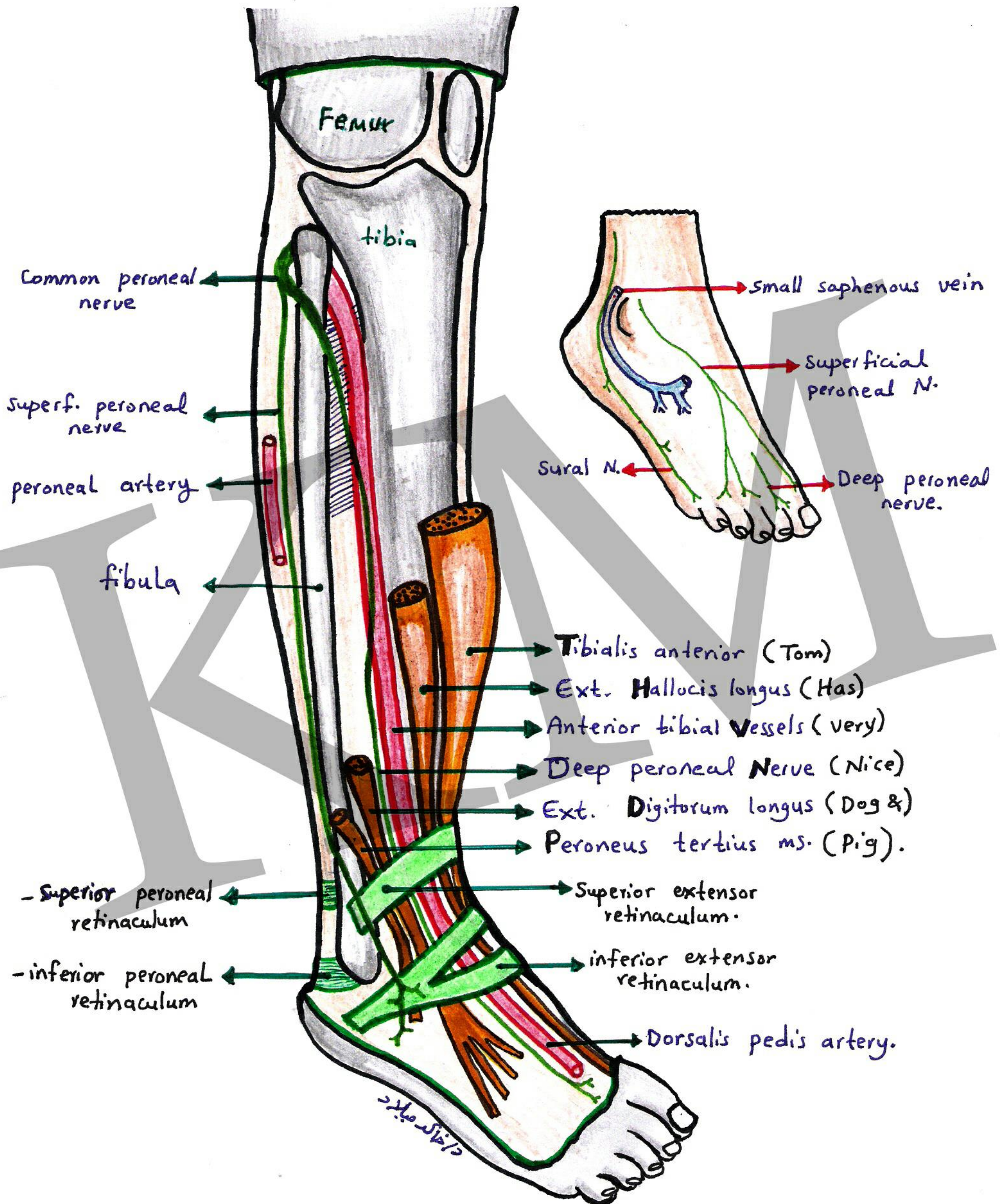
↳ by medial & lateral plantar branches

	Tibial Nerve	Common peroneal	superf. peroneal	Deep peroneal N
Begin.	Terminal br of sciatic (Larger)	Terminal br sciatic (smaller)	Terminal of common peroneal (smaller)	Terminal of common peroneal (larger)
End	Med. & Lat plantar N.	superf. & deep peron.	at skin of dorsum (cutaneous)	between 1 st & 2 nd toes (dorsum)
Branch	** [in popliteal fossa] ① Ms → P. Gc. S. PL. ② cut → Sural ③ art. → Knee ** [in the leg] ① Ms → Tp. FDL. FHL ② cut. → Med. cutaneous, Med. & Lat. plantar ③ art. → ankle	① Ms → biceps (short head) ② cut → sural comm. . LCN of calf ③ art → Knee	① Ms → PL. PB. ② cut → dorsum of foot -	① Ms → Ta. EHL. EDL EDB. PT ② cut → dorsum of foot bet. 1 st & 2 nd toe ③ art → ankle & Foot joints.
Course	running with posterior tibial artery	winds around neck of fibula	running with the peroneal artery	running with anterior tibial artery.

BACK OF LEG



FRONT OF LEG



COMPARTMENTS OF L.L.

THIGH COMPARTMENTS :-

* Contents of anterior fascial compartment :-

- Muscles :- Sartorius, iliacus, psoas major, pectineus & quadriceps (vastus medialis, lateralis, intermedius & rectus femoris).
- Blood supply :- femoral artery.
- Nerve supply :- femoral nerve

all muscles of ant. compartment are supplied by femoral nerve except Psoas major by lumbar plexus.

* Contents of medial compartment :-

- Muscles :- adductor magnus, add. brevis, add. longus, gracilis & obturator externus.
- Blood supply :- obturator artery & Profunda femoris artery.
- Nerve supply :- obturator nerve.

all muscles of medial compartment are supplied by obturator nerve except hamstring portion of add. magnus by sciatic N. (tibial portion).

* Contents of posterior compartment :-

- Muscles :- Biceps femoris, semitendinosus, semimembranosus & hamstring portion of add. magnus
- Blood supply :- Profunda femoris artery.
- Nerve supply :- sciatic nerve.

all muscles of posterior compartment are supplied by tibial portion of sciatic N. except short head of biceps by common peroneal portion of sciatic

LEG COMPARTMENT :-

* Contents of ant. compartment :-

- Muscles:- **T**ibialis anterior, extensor **H**allucis longus, extensor **D**igitorum longus & **P**eroneus tertius.
- Blood supply:- anterior tibial artery.
- Nerve supply:- deep peroneal nerve.

* Contents of posterior compartment:-

- Muscles:- (A) superficial group:-
 - Gastrocnemius, Plantaris & soleus.
- (B) deep group:-
 - **T**ibialis posterior, flexor **H**allucis longus, flexor **D**igitorum longus & **P**opliteus.
- Blood supply:- Posterior tibial artery.
- Nerve supply:- Tibial nerve.

* Contents of lateral compartment:-

- Muscles:- Peroneus longus & Peroneus brevis.
- Blood supply:- Peroneal artery.
- Nerve supply:- superficial peroneal nerve.

REGION OF ANKLE

ANTERIOR ASPECT :

* Superior extensor retinaculum :-

- Thickened band of deep fascia.
- Attached to distal ends of anterior borders of fibula & tibia
(Near its medial end, splits to enclose tendon of tibialis anterior)

* Inferior extensor retinaculum :-

- Thickened Y-shaped band of deep fascia.
- Attached by its stem to calcaneum (in upper surface of anterior part).
 - upper limb of Y to medial malleolus
 - lower limb of Y to Plantar fascia
- (it is separated into compartments by fibrous septa separate the tendons and are lined by synovial sheath).

* structures Pass anterior (superf.) to ext. retinaculum :-

- ① Saphenous nerve & great saphenous vein (front medial malleolus).
- ② Superficial peroneal nerve (medial & lateral branches).

* structures Pass through (deep) to ext. retinaculum :-

- | | |
|-------------------------------------|---------|
| ① Tibialis anterior tendon. | (Tom) |
| ② Extensor Hallucis longus. | (Has) |
| ③ Anterior tibial Vessels | (Very) |
| ④ Deep peroneal Nerve. | (Nice) |
| ⑤ Extensor Digitorum longus tendon. | (Dog) & |
| ⑥ Peroneus tertius. | (Pig). |

POSTERIOR ASPECT

* Superior Peroneal retinaculum :-

- Lies behind lateral malleolus over peroneus longus & brevis. ^{→ having common synovial sheath}
- Attached above to lateral malleolus & below to calcaneus.

* Inferior Peroneal retinaculum :-

- lies behind lateral malleolus over peroneus longus & brevis. ^{→ here having separate synovial sheath}
- Attached above & below to calcaneus (continue above is stem of ext. Ret. ^{inf.}).

* Flexor retinaculum :-

- Lies below & behind medial malleolus.
- attached above to medial malleolus & below to calcaneus (med. tubercle)

* Structures Passing deep to flexor retinaculum :-

(Behind medial malleolus):

- ① - Tibialis posterior tendon. (Tom)
- ② - Flexor Digitorum longus. (Does)
- ③ - Posterior tibial Vessels. (Very)
- ④ - Tibial Nerve. (Nice)
- ⑤ - Flexor Hallucis longus (Hat)

NB:- superficial to superior peroneal retinaculum → sural nerve & small saphenous vein.

NB:- Directly behind the ankle → tendocalcaneus & fat.

peroneal artery

fibula

Tibialis anterior (Tom)

Ext. Hallois longus (Has)

Anterior tibial vessels (very)

Deep peroneal Nerve (Nice)

Ext. Digitorum longus (Dog &)

Peroneus tertius ms. (Pig).

- Superior peroneal retinaculum

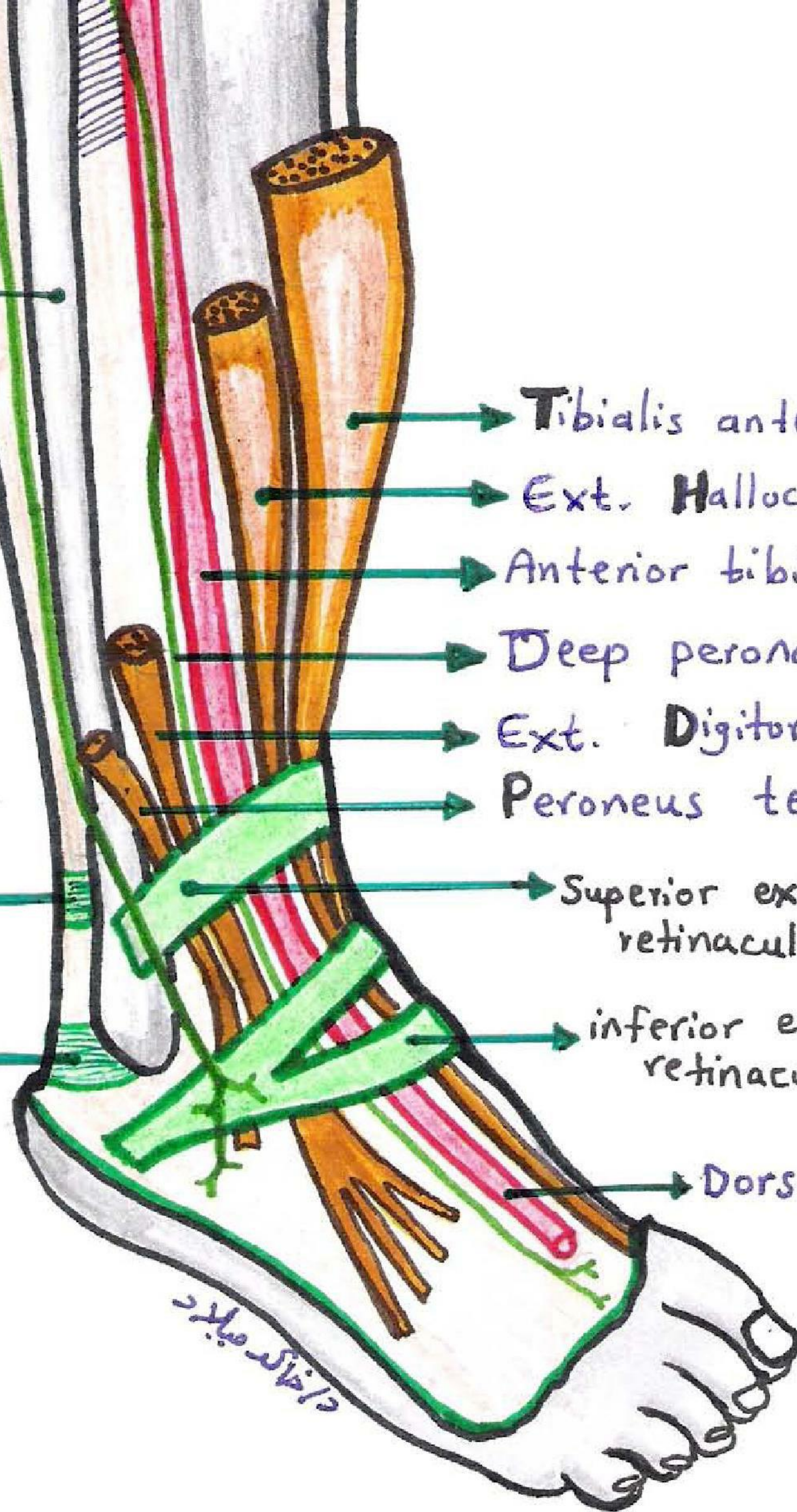
Superior extensor retinaculum.

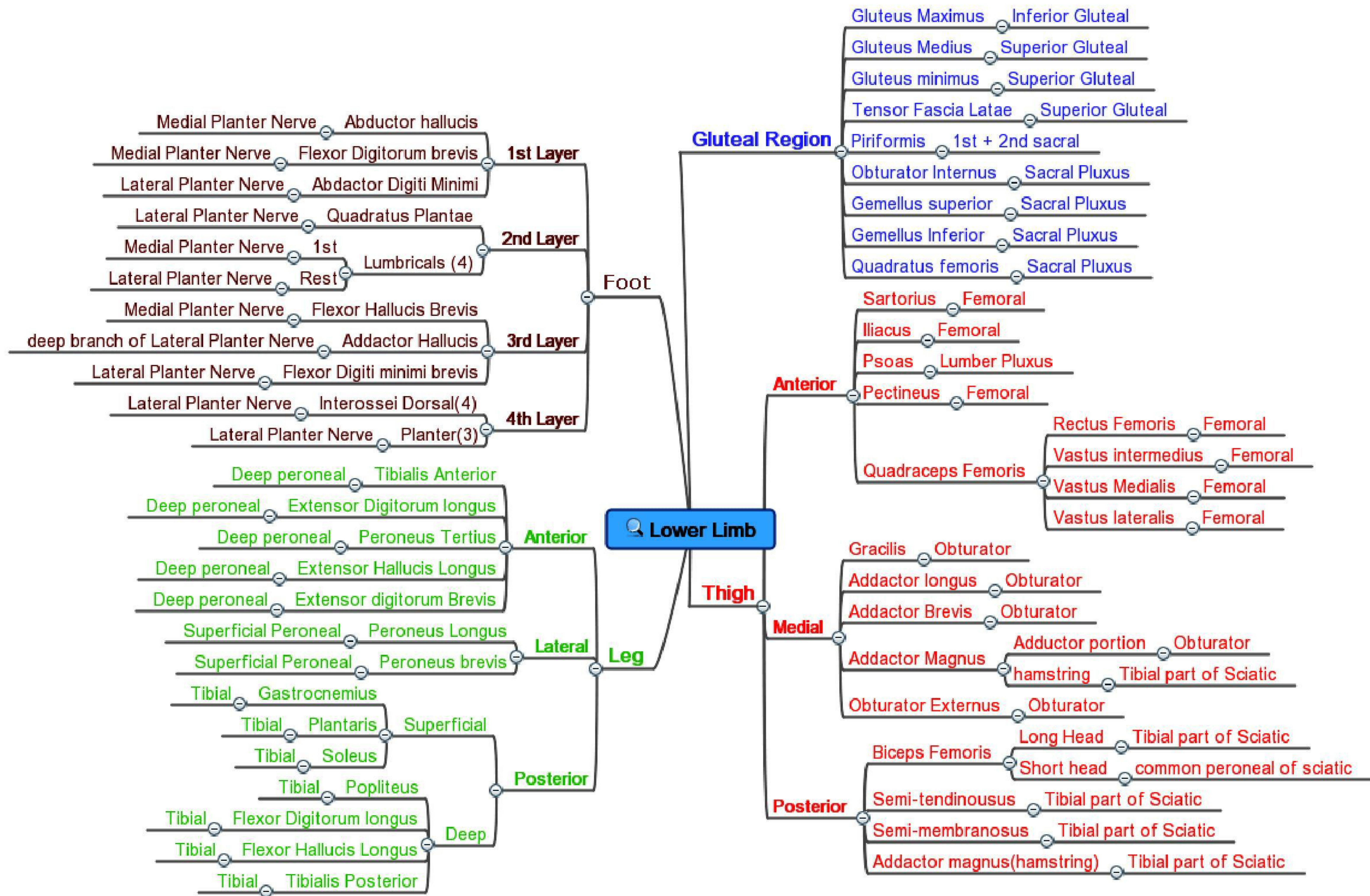
- inferior peroneal retinaculum

inferior extensor retinaculum.

Dorsalis pedis artery.

داخلی و بیرونی

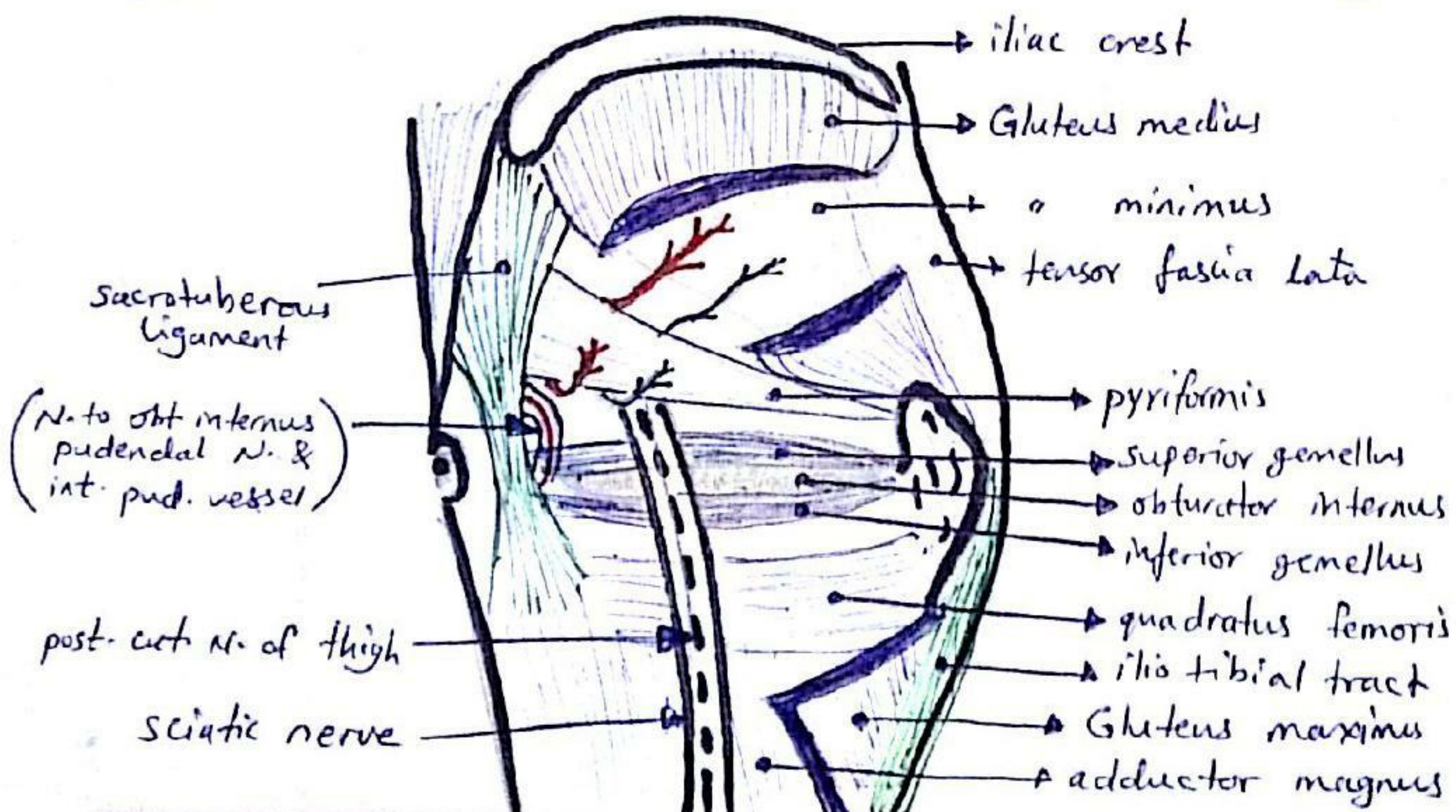




* Muscles of gluteal region :-

	Muscle	origin	insertion	N/s	action.
1-	piriformis	sacrum anteriorly (2,3,4 pieces)	Greater trochanter (upper border)	S ₁ - S ₂	Lateral rotor of thigh
2-	obturator internus	inner surface of obt membrane	" "	Sacral plexus	" " "
3-	Superior gemellus	ischial Spine	" "	" "	" " "
4-	Inferior "	" tuberosity	" "	" "	" " "
5-	Quadratus femoris	" "	quadratus tubercle of femur	" "	" " "
6-	Gluteus maximus	ileum (outer surface) + Sacrum + coccyx + sacrotuber. lig.	Iliotibial tract + gluteal tuberosity of femur	Inferior gluteal nerve	Extend knee Extend hip + laterally rotate hip
7-	Gluteus medius	ileum (outs surface)	Greater trochanter (lat. surface)	Superior gluteal	Abduction thigh + tilt pelvis
8-	Gluteus minimus	" " "	Greater trochanter (ant surface)	" "	" " "
9-	Tensor fascia lata	iliac crest	Iliotibial tract	" "	Extend knee

N.B. the first 5 muscles are called lateral rotators of thigh.



* MUSCLES OF MEDIAL COMP. OF THIGH. (5)

	ORIGIN	INSERTION	N/S	ACTION
Obturator externus	obt. membrane "outer surface" + pubic & ischial ramus	Greater Trochanter "medial surface"	obturator N.	Lateral rotation of thigh
Gracilis	- ischial ramus & inferior pubic ramus	shaft of Tibia "upper medial SAS"	" "	- Adduct thigh + flex leg
Adductor brevis	inferior pubic ramus	shaft of femur "linea aspera"	" "	- Adduct thigh + LR (assist)
Adductor longus	- pubic body (medial to pubic tubercle)	" "	" "	" "
Adductor Magnus	inferior pubic ramus - ischial ramus & tuberosity	" " & add. tubercle	obt. nerve + sciatic N (hamstring)	" "

NB: — LR = Lateral rotation MR = medial rotation

— hamstring portion of add. magnus present in posterior compartment & supplied by sciatic N. & do extension of thigh.

* MUSCLES OF POSTERIOR COMP. OF THIGH. (3)

	ORIGIN	INSERTION	N/S	ACTION
Semitendinosus	Ischial tuberosity	shaft of tibia (upper medial part) (SAS)	Sciatic N (tibial portion)	- Extends thigh - flexion & MR of leg.
Semimembranosus	" "	Medial condyle of tibia	Sciatic N (tibial part)	- Extends thigh - flexion & MR of leg.
Biceps femoris	(Long head) isch. tuberosity (short head) linea aspera & LSR	head of fibula	Sciatic N - tibial portion for long head Common peroneal for short head	- Extends thigh by long head. - flexion & LR of leg by 2 heads

LSR = Lat. supracondylar ridge



* MUSCLES OF ANTERIOR COMP. OF THIGH. (8)

	ORIGIN	INSERTION	N/S	ACTION
psoas	T ₁₂ , L ₁ → 5 vertebral bodies & Transverse processes & discs	Lesser Trochanter	Lumbar plexus	- flex thigh on hip - or flex trunk.
Iliacus	iliac fossa	" "	femoral nerve	" " or " "
Sartorius	ASIS	shaft of tibia (upper medial part) SGS	" "	- flexion + LR + <u>abduct</u> thigh & flexion + MR of leg
pectineus	pubis (superior ramus)	shaft of femur (upper end of Linea aspera)	" "	flexion & <u>adduction</u> of thigh
Rectus femoris	• straight head from AIIS • Reflected head above acetabulum	quadriceps tendon to patella & by ligamentum patellae to tibial tubercle	" "	- flexion of thigh - extension of leg
vastus medialis	shaft of femur & its upper end	"	" "	- extension of leg
vastus lateralis	" "	"	" "	" " "
vastus intermedius	" "	"	" "	" "

N.B. → ASIS = Anterior Superior Iliac Spine.

→ AIIS = " Inferior " " "

→ SGS = common insertion of Sartorius, Gracilis & Semitendinosus.

→ Rectus femoris & vastus med., lat. & intermedius called (Quadriceps muscle).

ASIS gives origin to $\left\{ \begin{array}{l} \text{Inguinal Lig.} \\ \text{Sartorius} \end{array} \right.$

AIIS " " to $\left\{ \begin{array}{l} \text{iliofemoral lig.} \\ \text{straight head of rectus femoris} \end{array} \right.$

انقباض

* LEG "LATERAL COMP. MS.":

	ORIGIN	INSERTION	N/S	ACTION
- peroneus longus.	Shaft of tibia (lat. surface)	- Base of 1 st meta-tarsal & + medial cuneiform	superficial peroneal nerve	- plantar flexion & eversion "foot" - support lat. longit. & transverse arch
- peroneus brevis.	" "	- Base of 5 th MT	"	- plantar flexion & eversion - support lat. longit. arch of foot

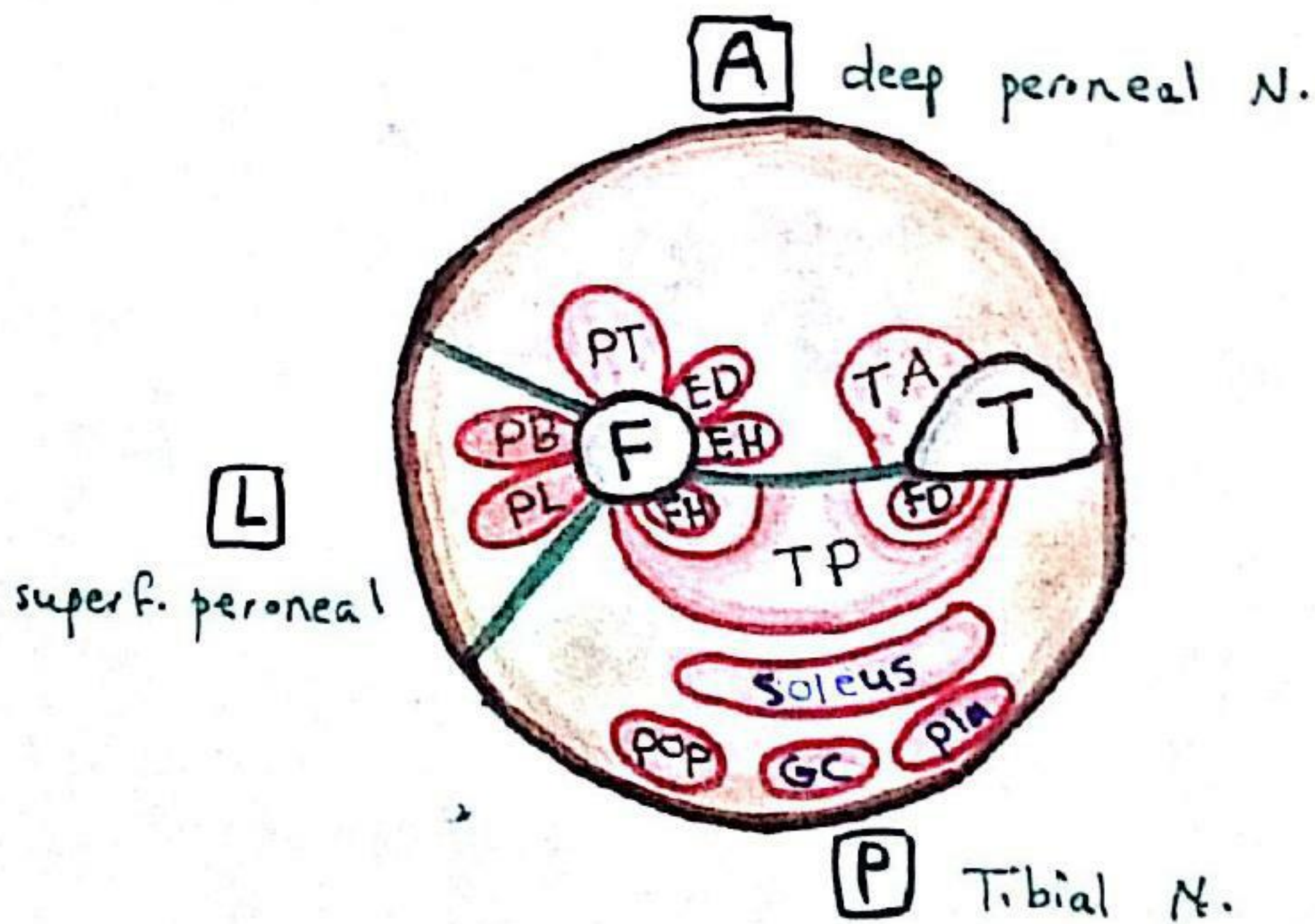
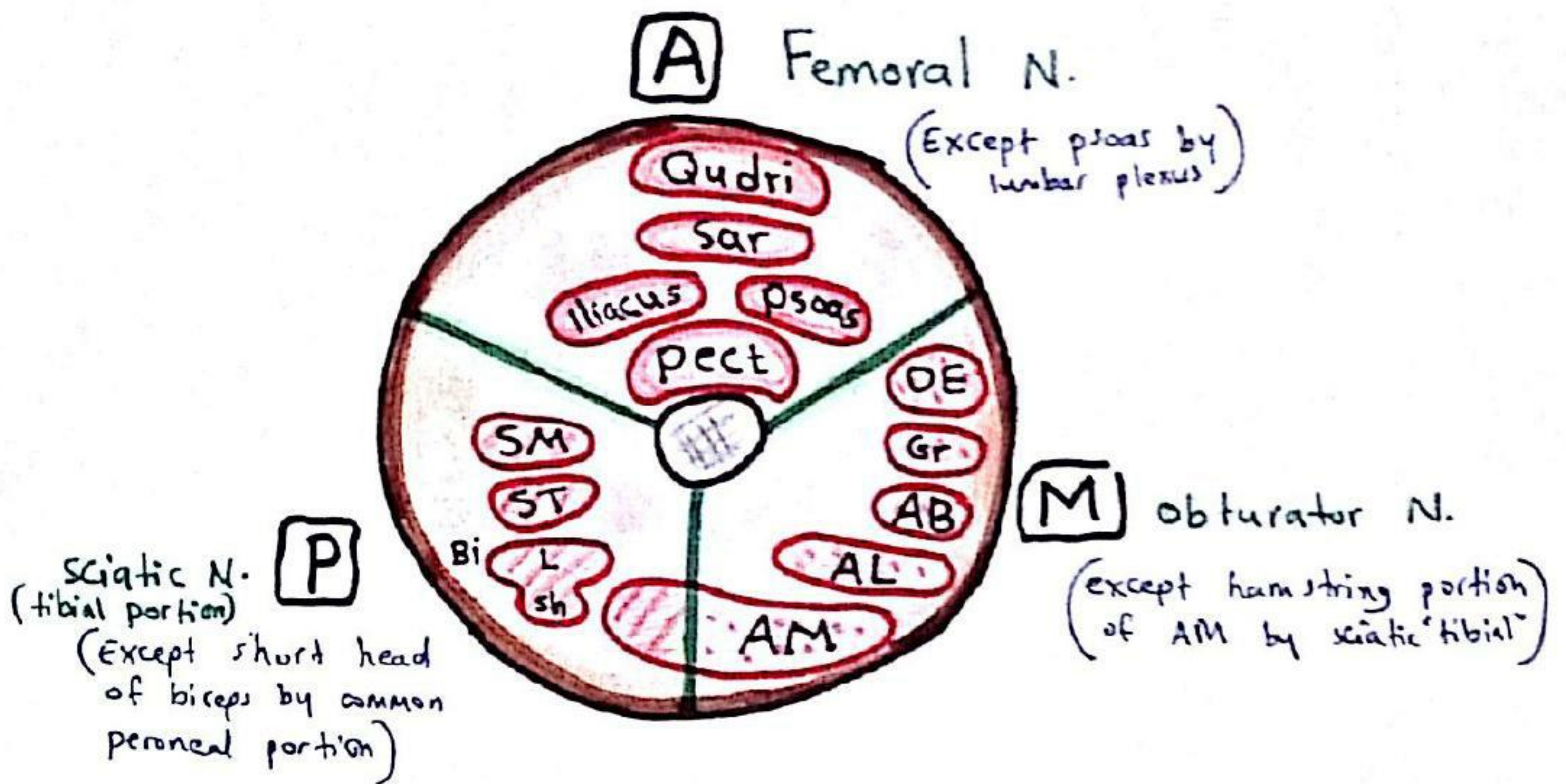
* LEG "ANTERIOR COMP. MS.":

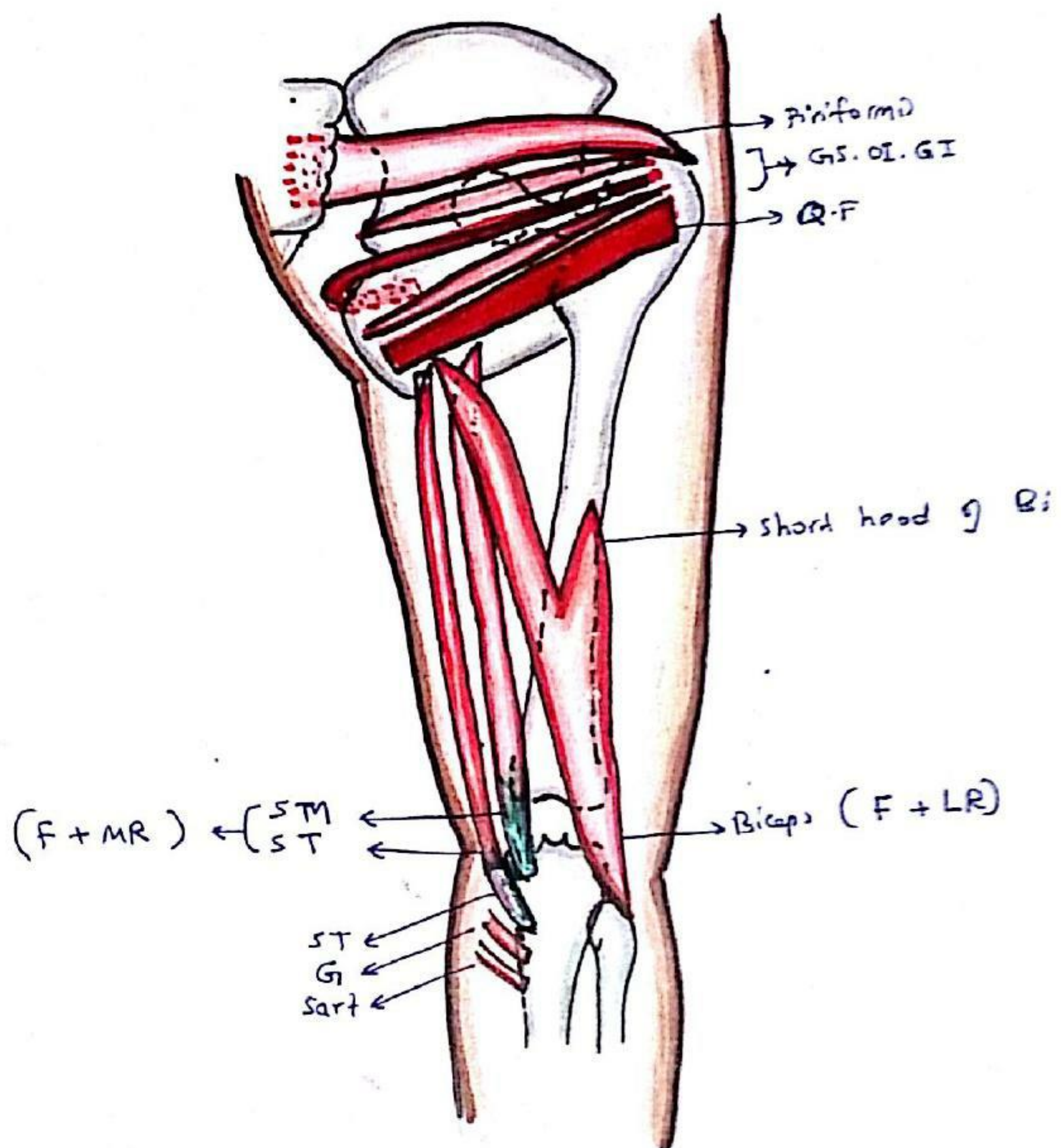
	ORIGIN	INSERTION	N/S	ACTION
- peroneus tertius	- Shaft of tibia (ant. surface)	- Base of 5 th MT	Deep peroneal nerve	- extension & eversion "foot"
- Tibialis anterior	- Shaft of tibia (lat. surface) + INTEROSSEOUS MEM.	- Base of 1 st MT + med. cuneiform	" "	- extension & + inversion "foot" (support med. long. arch)
- Ext. hallucis longus	- Shaft of tibia (ant. surf.)	- Distal phalanx of big toe	" "	- extension of foot & big toe + inversion
- Ext. digitorum longus	- " " "	- extensor expansion of lat. 4 toes	" "	- extension of foot and toes
- Ext. digitorum brevis	Calcaneum	- proximal phalanx of 1 st , 2 nd , 3 rd & 4 th toes	" "	- extension of toes

* N.B - MT = meta-tarsal.

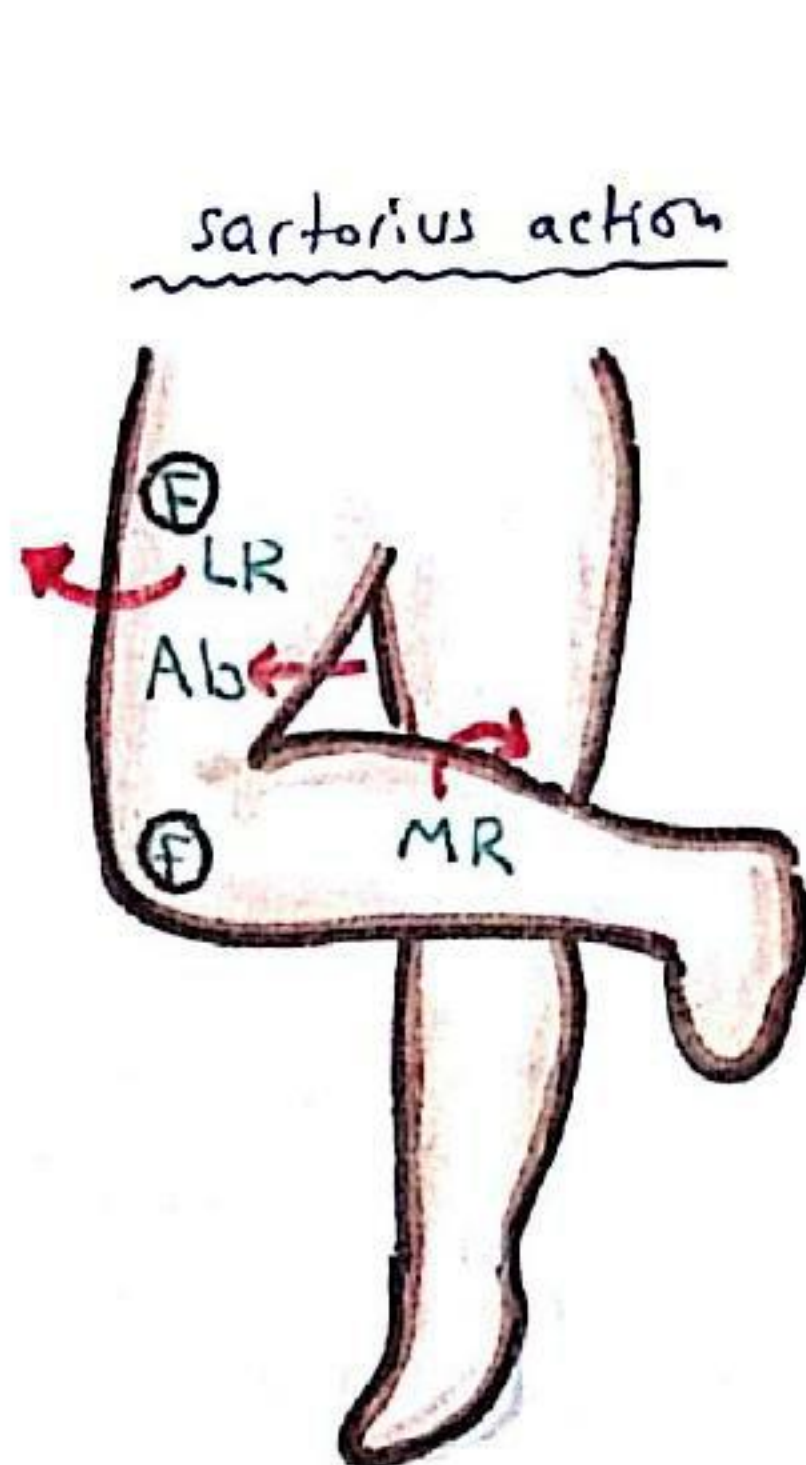
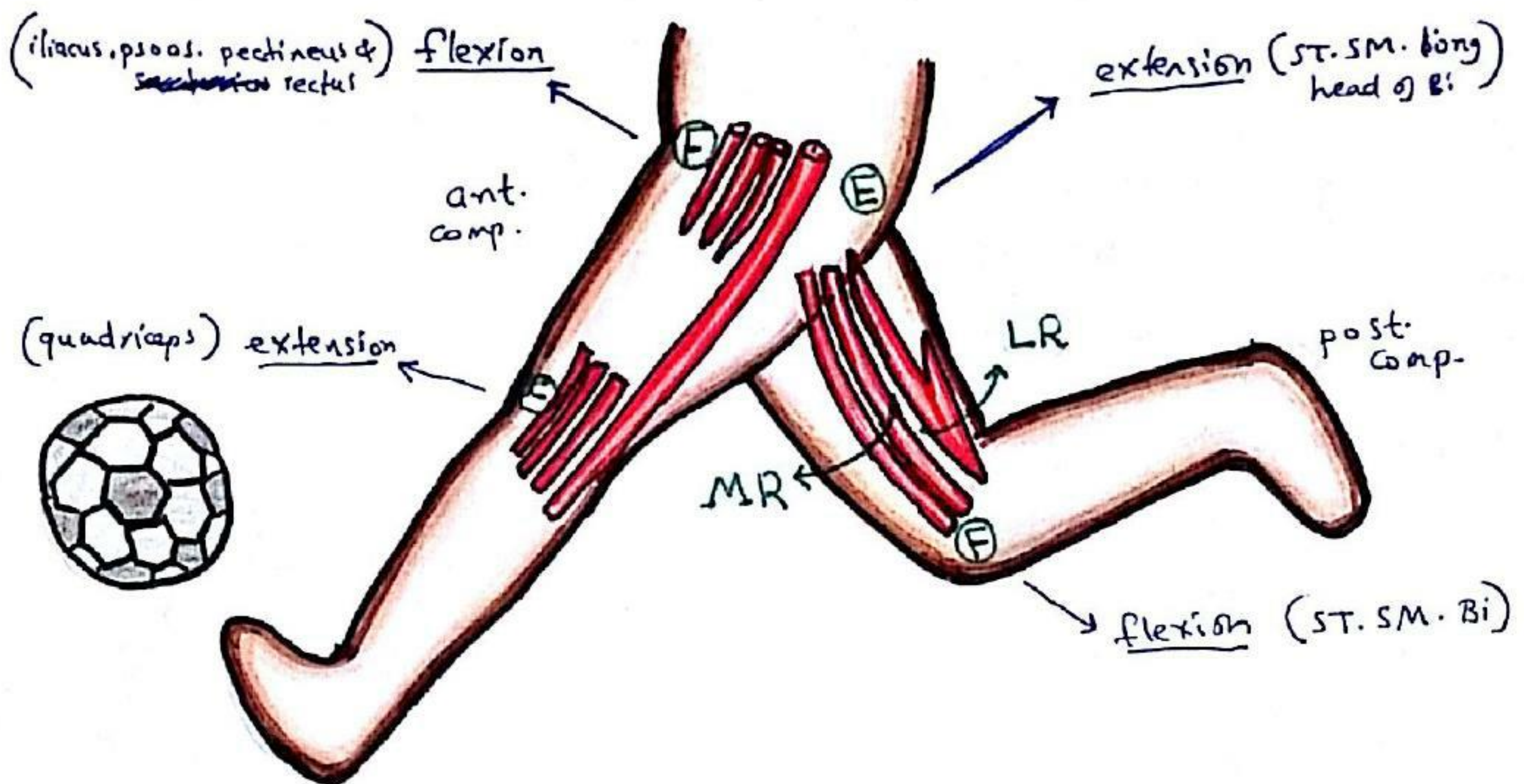
- Eversion done at subtalar & transverse tarsal joints & plantar & dorsal flexion at ankle joint
- Eversion done by peroneus longus, brevis & tertius.
- Inversion " " tibialis ant. & ext. hall. longus.

(Thigh & leg compartments)





* Ms of thigh (action)



GMd. GMn action



THE FOOT

Skin & Fascia :- Discussed before.

Muscles of foot :-

[A] Muscle of dorsum is extensor digitorum brevis.

[B] Muscles of sole of the foot are divided into 4 layers :-

• **FIRST LAYER** :-

- ① Abductor hallucis. $\xrightarrow{N/S}$ MPN (Medial Plantar nerve)
- ② Flexor digitorum brevis (FDB) $\xrightarrow{\quad}$ MPN
- ③ Abductor digiti minimi. $\xrightarrow{\quad}$ LPN

• **SECOND LAYER** :-

- ① Quadratus plantae $\xrightarrow{(F.D. accessorius)}$ LPN
- ② Lumbricals (4 muscles). $\xrightarrow{\quad}$ 1st by MPN
others $\rightarrow$ LPN
- ③ Flexor digitorum longus tendon.
- ④ Flexor hallucis longus tendon.

• **THIRD LAYER** :-

- ① Flexor hallucis brevis. $\xrightarrow{\quad}$ MPN
- ② Adductor hallucis. $\xrightarrow{\quad}$ LPN (deep branch)
- ③ Flexor digiti minimi brevis. $\xrightarrow{\quad}$ LPN

• **FOURTH LAYER** :-

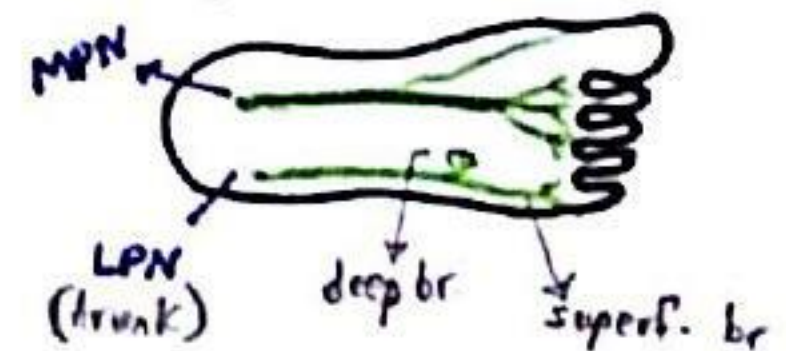
- ① Interossei (4 dorsal & 3 plantar). $\xrightarrow{\quad}$ LPN
- ② Peroneus longus tendon.
- ③ Tibialis Posterior tendon.

N.B :- origin, insertion, N/S & action $\xrightarrow{\quad}$ discussed later.

NERVES OF FOOT :-

* Medial Plantar N. :- (MPN)

- **Beginning** :- Terminal branch of tibial nerve. (deep to flexor retinaculum)
- **End** :- at base of 1st metatarsal bone by dividing into 3 common plantar digital nerves
- **Course & relations** :- runs deep to abductor hallucis lateral to the medial plantar artery.
- **Branches** :-
 - ① Muscular branches to [Abductor hallucis, flexor hallucis brevis, Flexor digitorum brevis & 1st lumbrical ms]
 - ② Cutaneous branches to medial 3.5 toes (& dorsum of their distal phalanges.).
 - ③ Articular branches to tarsal & metatarsal joints



* Lateral Plantar N. :- (LPN)

- **Beginning** :- Terminal branch of tibial nerve. (deep to flexor retinaculum).
- **End** :- at base of 5th metatarsal bone by dividing into a superficial & deep branch.
- **Course & relations** :- runs deep to abductor hallucis & FDB Medial to lateral plantar artery.
- **Branches** :-
 - A. Main trunk** :-
 - ① Muscular to quadratus plantae, abductor digiti minimi.
 - ② cutaneous to skin of lateral part of sole.
 - B. superficial terminal branch** :-
 - ① Muscular to flexor digiti minimi, 3rd plantar interosseous and 4th dorsal interosseous.
 - ② cutaneous to lateral 1.5 toes (& dorsum of distal phalanges)
 - C. deep terminal branch** :-
 - Muscular to • adductor hallucis, Lumbricals (2nd, 3rd & 4th) and interossei (1st & 2nd plantar and 1st, 2nd & 3rd dorsal)

ARTERIES OF FOOT

* Medial Plantar A. :-

- **Beginning** :- Smaller terminal branch of posterior tibial artery. (deep to flexor ^{retinaculum})
- **End** :- by supplying medial side of big toe
- **Course & relations** :- runs deep to abductor hallucis medial to MPN.
- **Branches** :- ① Muscular branches.
② Articular branches. 3 superf. digital branches.
③ Cutaneous branches (accompany digital branches of MPN
Join medial 3 plantar metatarsal arteries)

* Lateral Plantar A. :-

- **Beginning** :- Larger terminal branch of posterior tibial artery. (deep to flexor ^{retinaculum})
- **End** :- at base of 5th metatarsal bone, continues as plantar arch,
Joins dorsalis pedis artery (at proximal end of 1st intermetatarsal space).
- **Course & relations** :- runs deep to abductor hallucis & FDB lateral to LPN.
- **Branches** :- ① Muscular branches
② anastomotic branches (join tarsal & arcuate arteries).
③ cutaneous (superficial) branches.

* Branches of Plantar arch :-

① Plantar metatarsal arteries :-

- each gives 2 plantar digital arteries (to sides of 2 adjacent toes).
- each gives distal perforating branch (to join corresponding dorsal metatarsal artery).

② Plantar digital artery ; to lateral side of little toe.

③ Proximal perforating branches :-

- Three branches pass dorsally through 2nd, 3rd & 4th interosseous space
- Join lateral dorsal metatarsal arteries.

* Dorsalis pedis artery :- discussed before.

*Anastomosis around ankle:-

- ① Medial malleolar ā
- ② Lateral malleolar ā } → anterior tibial artery.
- ③ Medial malleolar ā
- ④ Medial calcaneal ā } → posterior tibial artery.
- ⑤ lateral malleolar ā
- ⑥ lateral calcaneal ā } → Peroneal artery.
- ⑦ Perforating artery
- ⑧ Medial tarsal ā
- ⑨ lateral tarsal ā } → dorsalis pedis artery.
- ⑩ anastomotic branches of → lateral plantar artery.

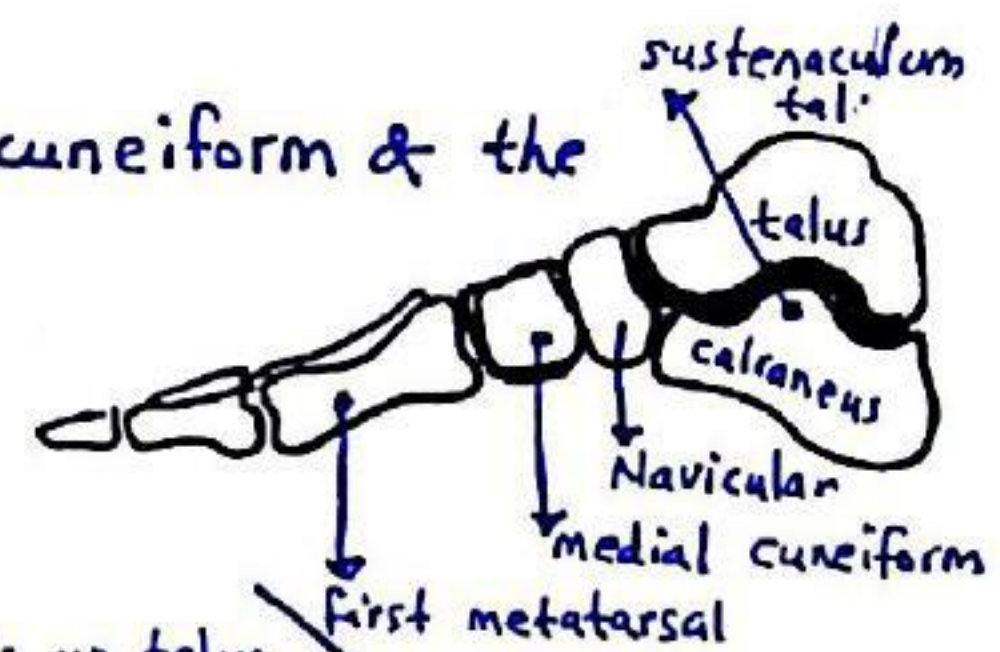
ARCHES OF FOOT :-

① Medial longitudinal arch:-

* Formed by :- calcaneum, talus, navicular, the 3 cuneiform & the first 3 metatarsal bones

* Maintenance of the arch:-

- ① Key stone :- is head of talus.
- ② Shape of bones :- sustentaculum tali holds up talus.
 • concave surface of navicular receive head of talus.
 • concave " " medial cuneiform receive navicular bone.
- ③ Plantar ligaments (Plantar calcaneo-navicular) & tendinous extension of tibialis posterior → tying inferior edges of bones.
- ④ Plantar aponeurosis & muscles of sole → tying ends of bones.
- ⑤ Tibialis anterior & posterior → suspending the arch from above.



② Lateral longitudinal arch :-

* Formed by: Calcaneum, cuboid, 4th & 5th metatarsal

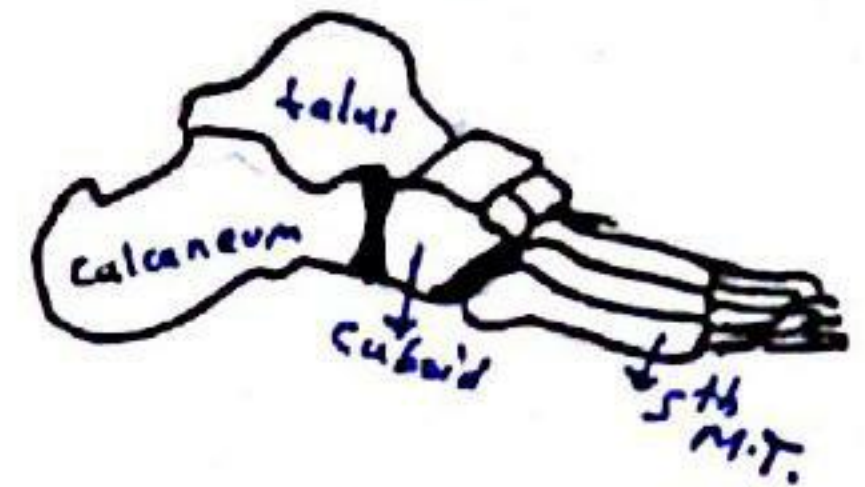
* Maintained by: ① Key stone → cuboid.

② Shape of bones.

③ Plantar ligaments → tying inferior edges of the bones.

④ Plantar aponeurosis & muscles of sole at lateral side → tying the ends of the arch together

⑤ Peroneus longus & brevis → suspending arch from above



③ Transverse arch :-

* Formed by: cuboid, 3 cuneiform bones & bases of the 5 metatarsal bones.

* Maintained by: ① shape of the bones → wedge shaping of bones.

② ligaments :- deep transverse & plantar lig → tying inferior edge of the bones.

③ Peroneus longus ^{tendon} → tying ends of the arch together.

④ Peroneus longus & brevis → suspending arch from above

① Medial longitudinal arch :-

JOINTS OF LOWER LIMB

HIP JOINT

*Articulation :- between head of femur (HOF) and acetabulum of hip bone.

- the acetabulum is deepened by fibro-cartilagenous rim (acetabular labrum), which bridges over acetabular notch forming transverse acetabular ligament.

*type :- synovial ball & socket (polyaxial).

*Capsule :- encloses the joint & attached :-

- Medially : to acetabulum labrum.
- Laterally : to intertrochantric line of femur (front) and halfway the back of neck of femur (behind).
- the capsule in front forms a retinacula (fibers with blood vessels reflected to head of femur. (supply head & neck)).

*Synovial membrane :-

- lines the capsule & ensheathes ligament of HOF.
- forms a psoas bursa protruding through the capsule anteriorly between pubofemoral & iliofemoral ligaments.
- Bursae associated with gluteus maximus
 1. between tendon & greater trochanter.
 2. between tendon & vastus lateralis.
 3. overlying ischial tuberosity.

* Ligaments of hip joint :-

① Iliofemoral lig. :- (Y-shaped) → very strong.

- attached above to A.I.S (ant. inf. iliac spine)
- below to upper & lower parts of intertrochantric line of femur
- Prevents overextension during standing & limits lateral rotation.

② Pubofemoral lig. :- (triangular lig.).

- attached by base to superior ramus of pubis
- apex to lower part of intertrochantric line.
- Limits extension, lateral rotation & abduction.

③ Ischiofemoral lig. :- (spiral in shape).

- attached between body of ischium & greater trochanter.
- limits extension & medial rotation.

④ Transverse acetabular lig. :-

- formed by acetabular labrum bridging acetabular notch.
- Converts the notch into a tunnel for blood vessels & nerves entering the joint.

⑤ Ligament of head of femur :- (triangular & flat in shape):

- attached by apex to fovea capitis. (a pit on HOF).
- base to transverse lig- & margins of acetabular notch.
- It is intracapsular ensheathed by synovial membrane.

* Nerve supply :-

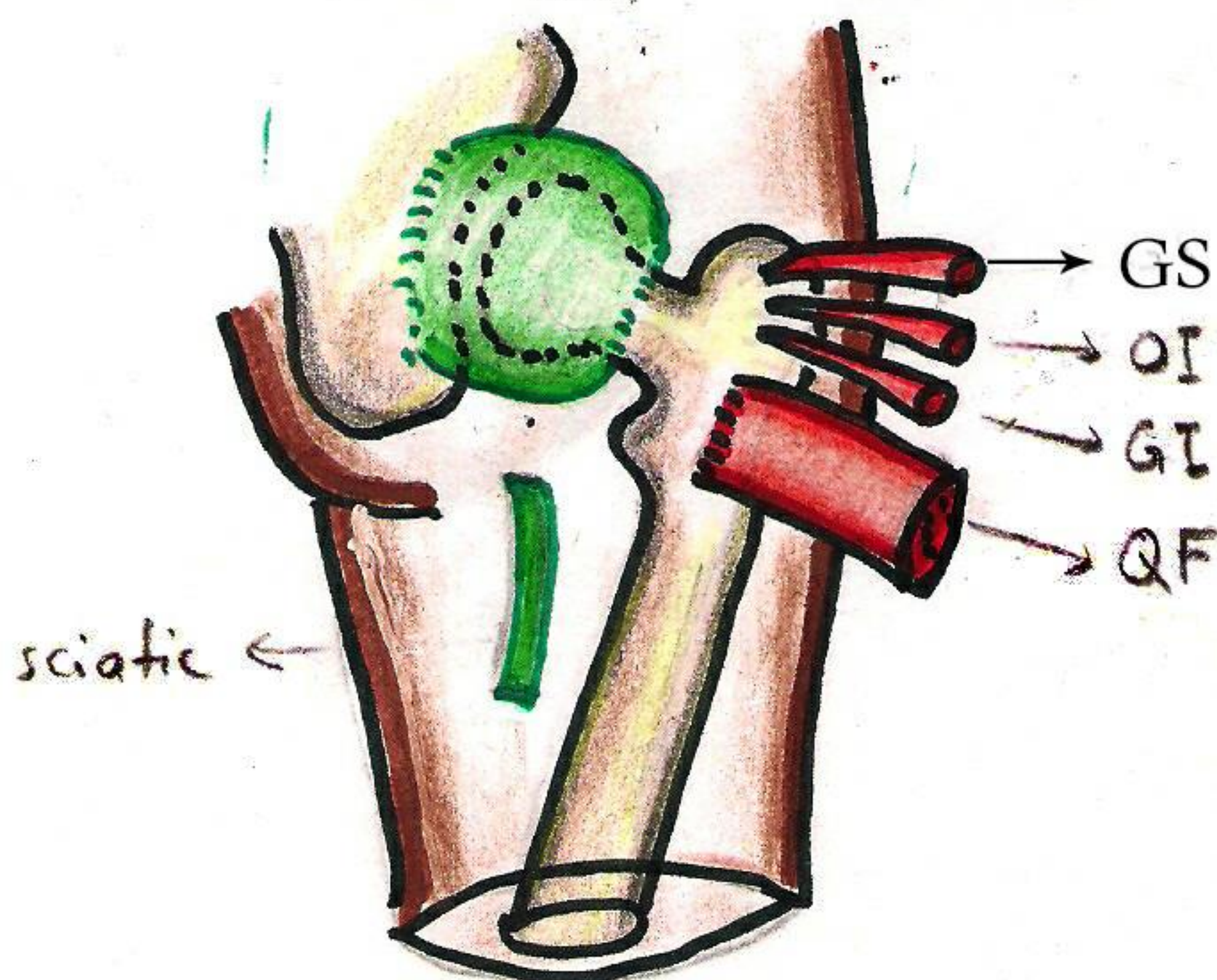
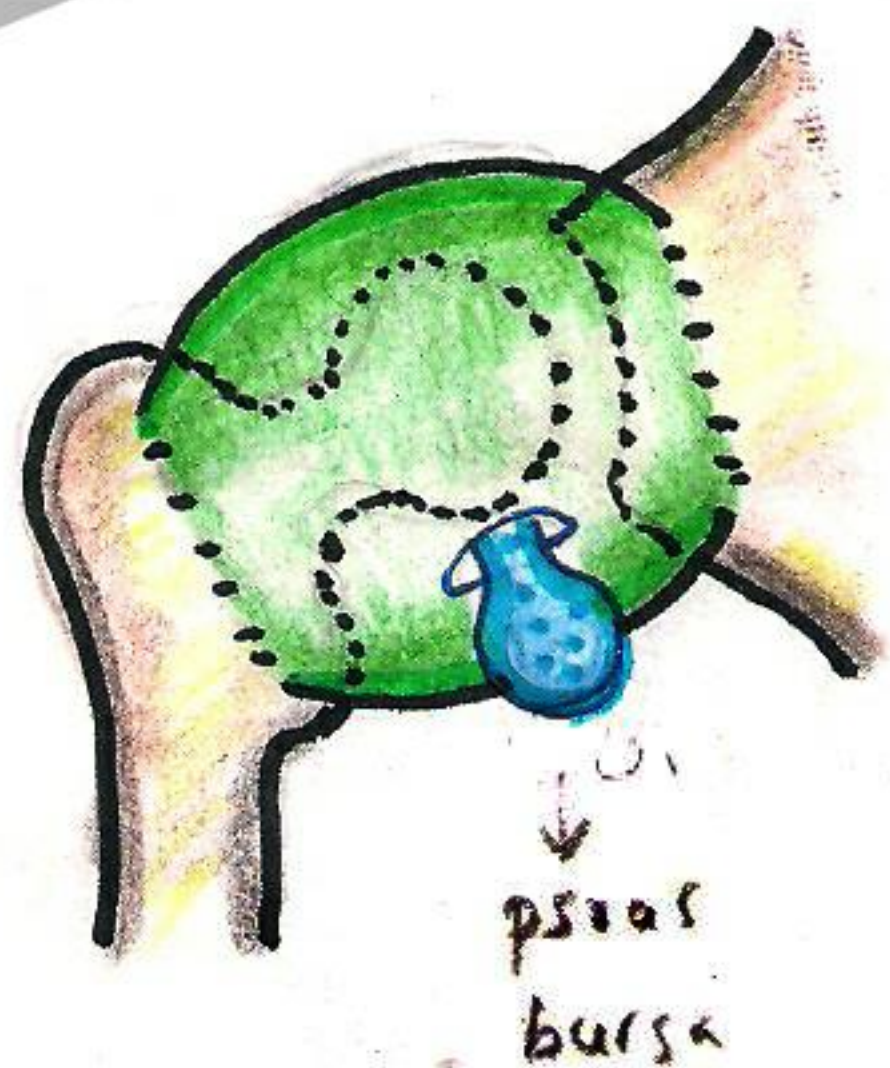
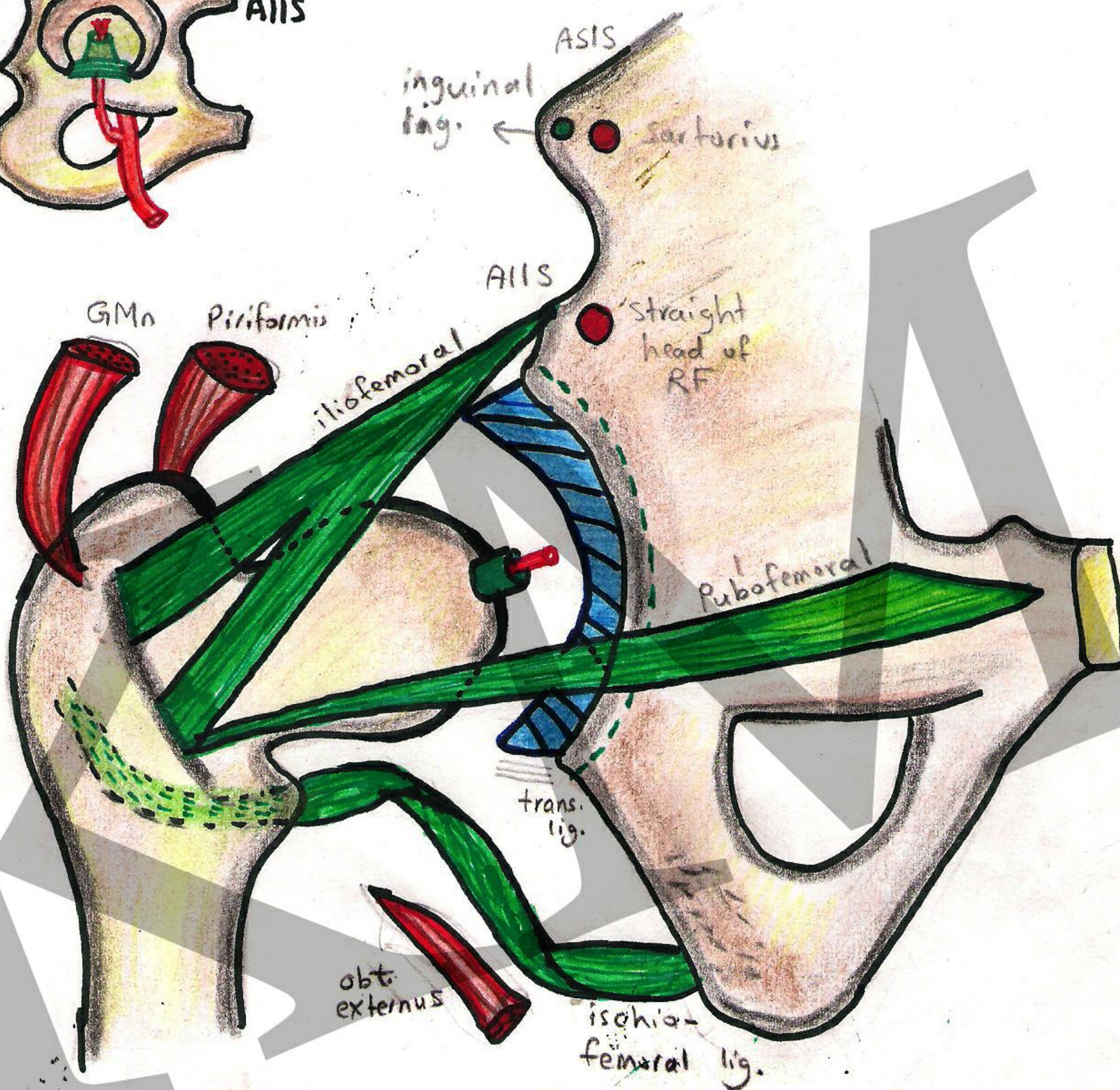
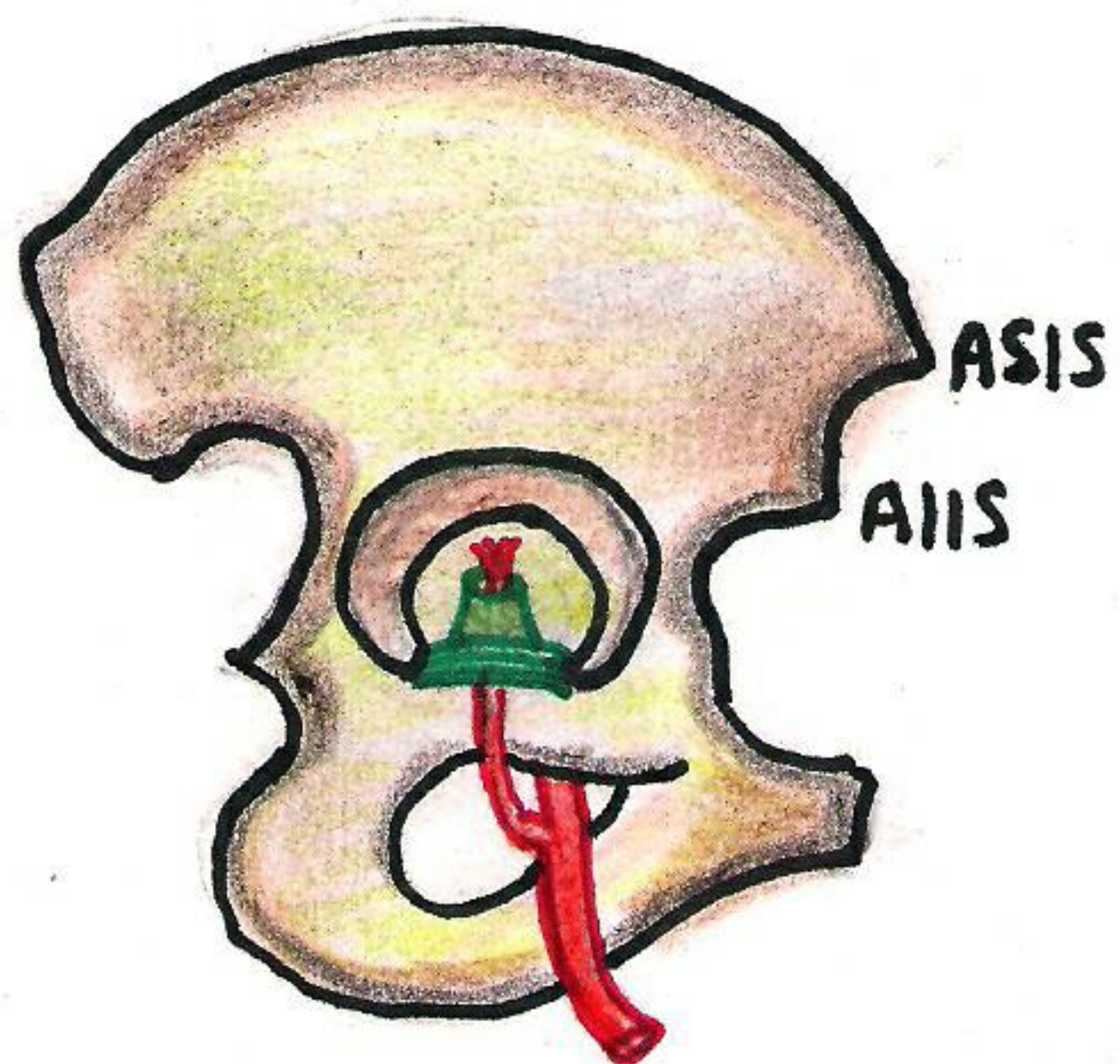
- supplied by femoral, obturator, sciatic & N. to quadratus femoris.

* Relation of hip joint :-

- Anteriorly :- femoral nerve & vessels, iliopsoas, pectineus & rectus femoris
- Posteriorly :- sciatic nerve, obturator internus, superior & inf. gemellus and quadratus femoris
- Superiorly :- piriformis & gluteus minimus.
- Inferiorly :- obturator externus tendon.

NB :- extensor ms are more powerful than flexor & lateral rotator are more powerful than medial rotators.

* Movement of hip joint - see later



KNEE JOINT

« Largest & most complicated joint in body »

* Articulation :- • above :- femoral condyles.

• below :- tibial condyles & their cartilagenous menisci.

• front :- patella. (with lower end of femur).

* Type :- - synovial modified hinge (hing with some rotation)
- synovial plane (gliding) → between patella & femur.

* Capsule :- attached to margins of articular surfaces.
- absent in front (for pouching of synovial membrane forming suprapatellar bursa).

* Synovial membrane :- lines the capsule.

- Bursae related to knee joint are :-

- | | |
|-------------------------|---|
| ① supra patellar. | ⑥ bursa deep to med. head of gastrocnemius |
| ② pre-patellar. | ⑦ bursa deep to lat. head of gastrocnemius |
| ③ superf. infrapatellar | ⑧ bursa deep to biceps tendon. |
| ④ deep infrapatellar | ⑨ semimembranosus bursa. |
| ⑤ popliteal bursa | ⑩ Goose's foot = bursa anserina
(for tendon of SGS.)
sartorius, gracilis, ST. |

* Nerve supply :- femoral, obturator, tibial & common peroneal nerve.

* Relation of Knee J. :-

- Anteriorly :- prepatellar bursa, tendinous expansion of vastus medialis & lateralis
- posteriorly ⑩ - contents of popliteal fossa (N.N.A.V. LN) ⑤
 - semimembranosus, semitendinosus, biceps femoris ③
 - gastrocnemius (med. & lat. heads) and plantaris ②
- Medially :- (SGS): sartorius, gracilis & semitendinosus
- laterally :- biceps femoris & common peroneal nerve.

*Ligaments of knee J. :-

I: • Extracapsular ligaments :-

① Ligamentum patellae :-

- attached to : lower border of patella & tibial tuberosity.
- separated from synovial membrane by infrapatellar pad of fat, from tibia by deep infrapatellar bursa and from skin by superficial infrapatellar bursa.

② Lateral collateral (fibular) lig. :-

- attached to :- lateral condyle of femur & head of fibula.
- separated from lateral meniscus by tendon of popliteus.

③ Medial collateral (tibial) lig. :-

- attached to Medial condyle of femur & med. surface of shaft of tibia
- firmly attached to edge of medial meniscus

④ Oblique popliteal lig. :-

- derived from semimembranosus tendon.
- It strengthens posterior aspect of the capsule.

II: • Intracapsular ligament :-

① Transverse ligament :-

- connects anterior horns of medial & lateral menisci.

② Cruciate lig. :- (main bond in knee joint)

A- Anterior cruciate lig. :- (ACL)

- attached to : anterior intercondylar area of tibia and post. part of medial surface of lateral condyle of femur.
- taut when knee is fully extended
- prevents post. displacement of femur on tibia & prevent tibia from pulling anteriorly with knee flexed.

B- Posterior cruciate lig. :- (PCL)

- attached to : posterior intercondylar area of tibia and ant. part of lateral surface of medial condyle of femur.
- taut when knee joint is flexed
- prevents ant. displacement of femur on tibia & prevent tibia from pulling posteriorly with knee flexed.

* Menisci of knee joint :- (2 semilunar cartilages)

① Medial meniscus :- semicircular (c-shaped).

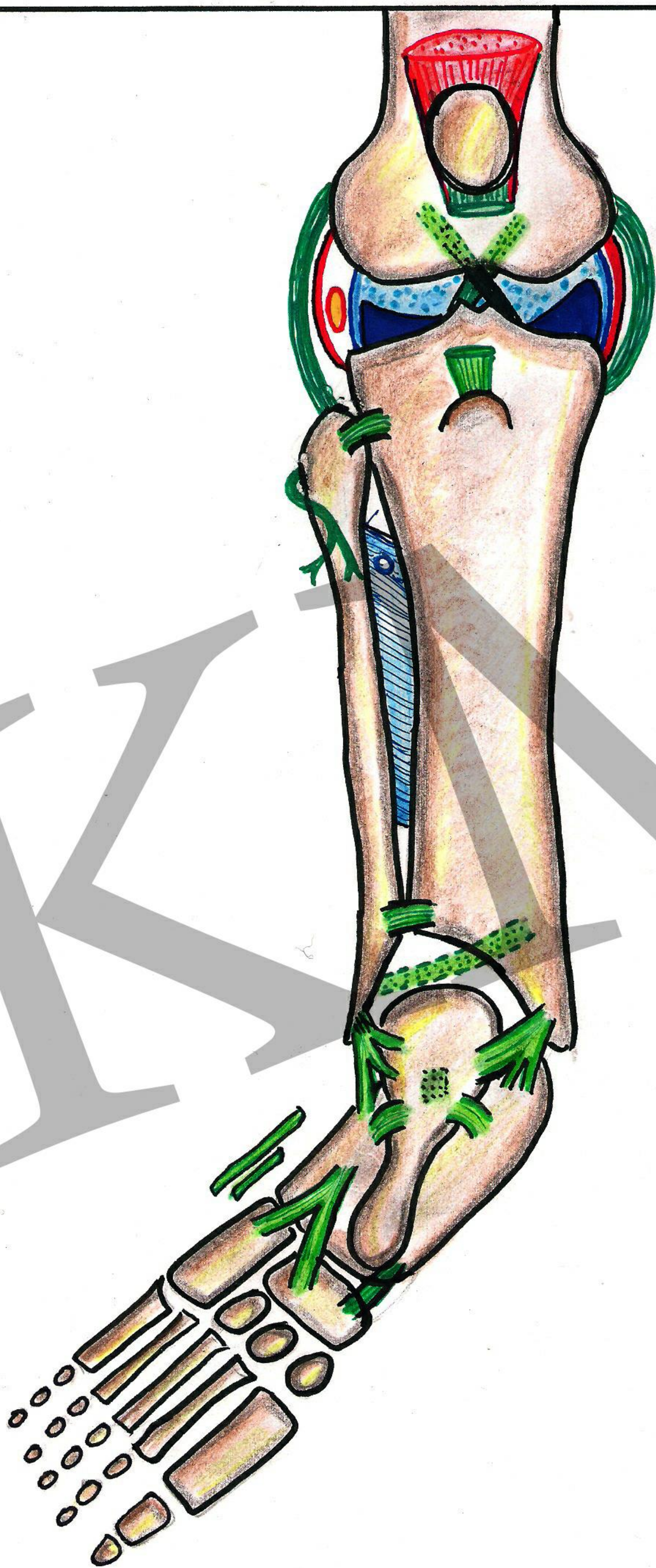
- Anterior horn : attached to ant. intercondylar area of tibia.
- posterior horn : to capsule & medial collateral lig. (relatively fixed).

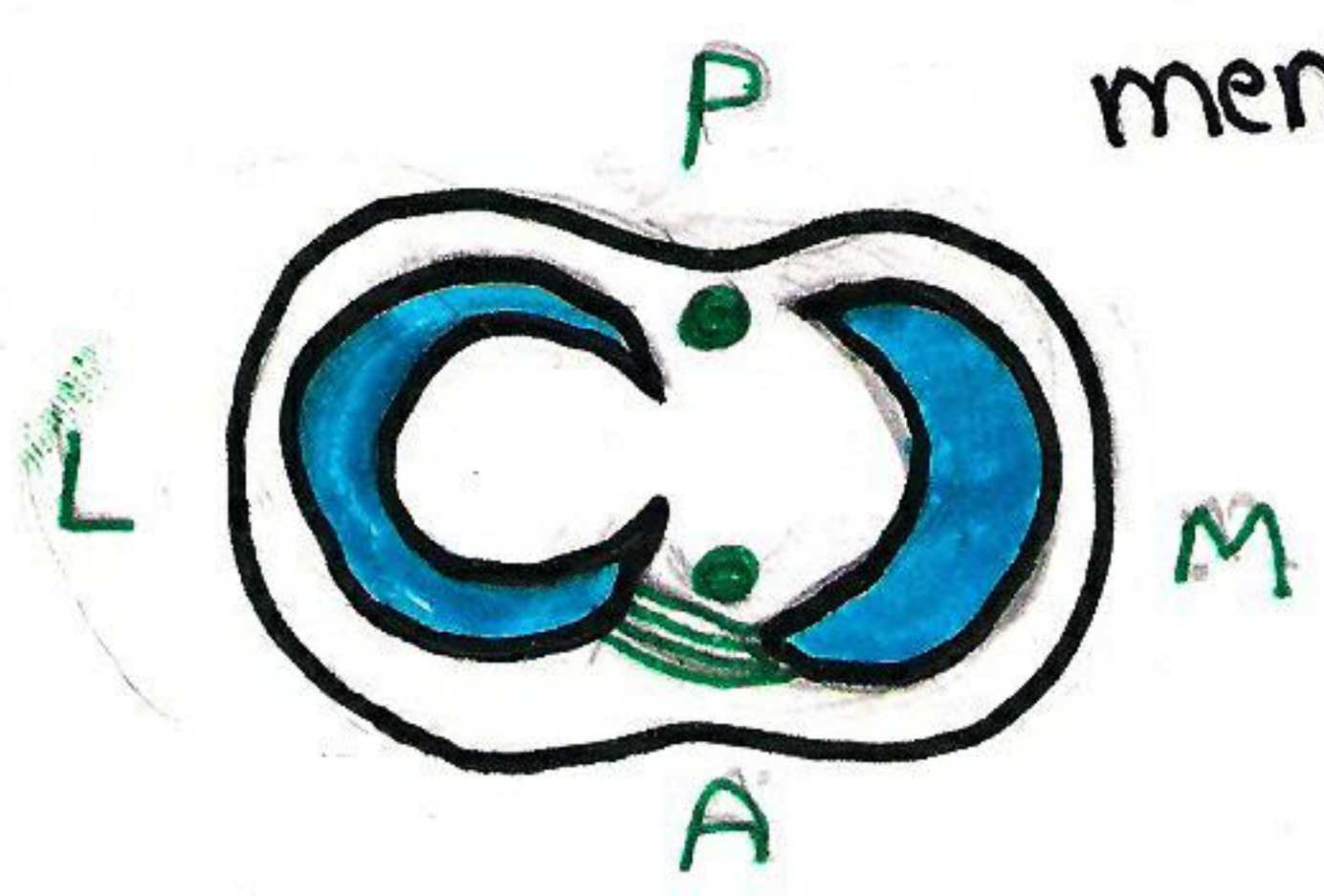
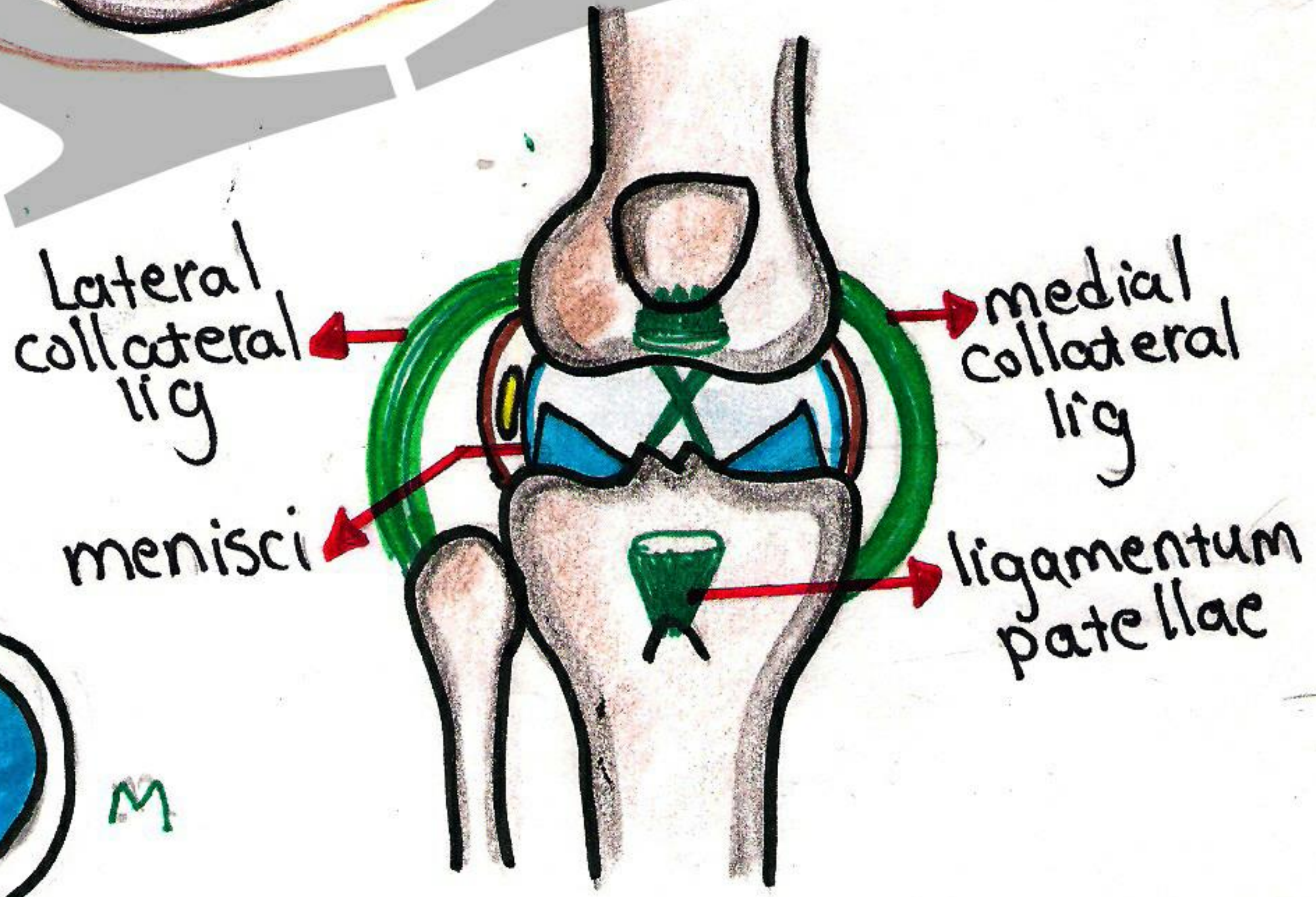
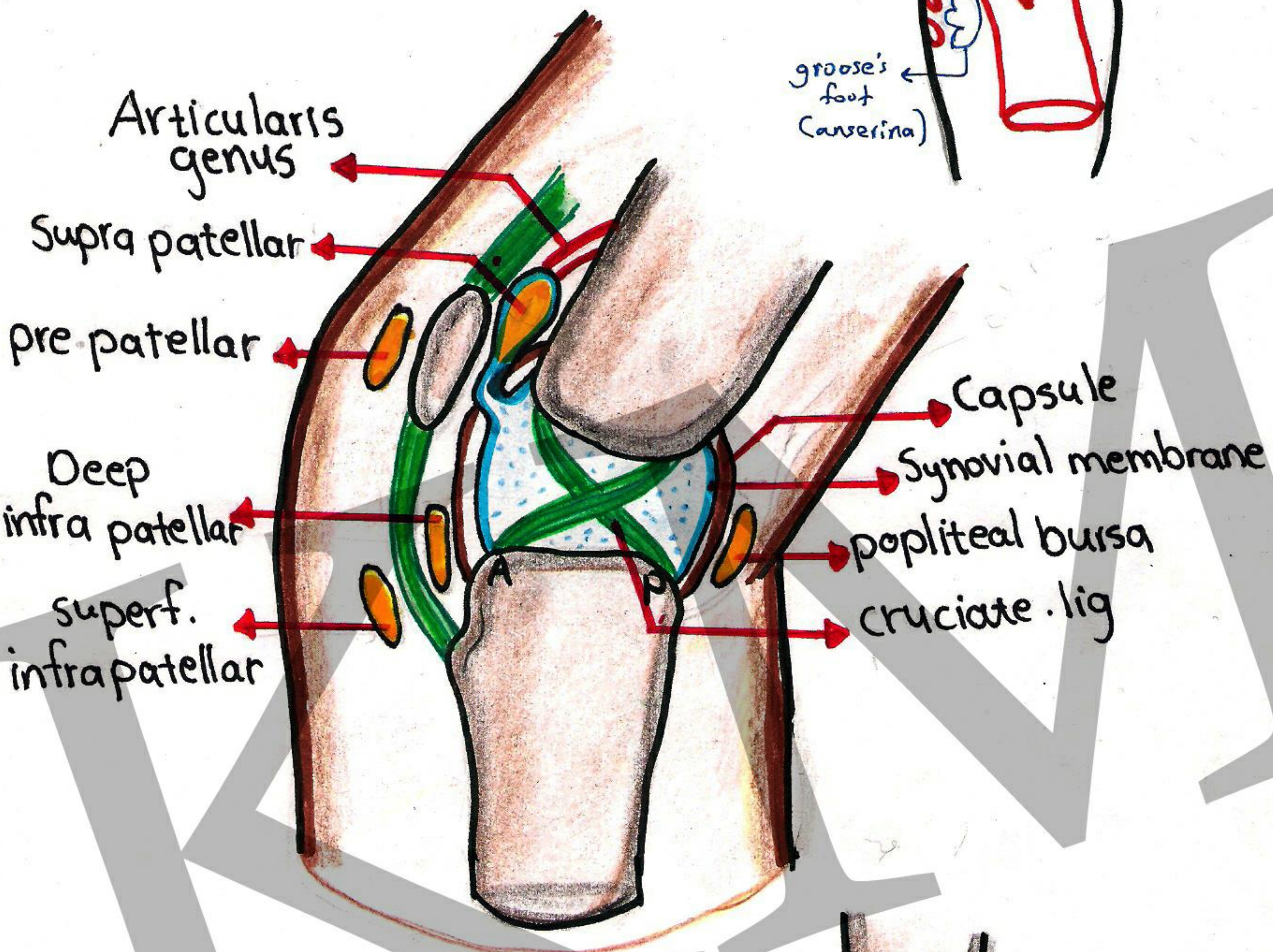
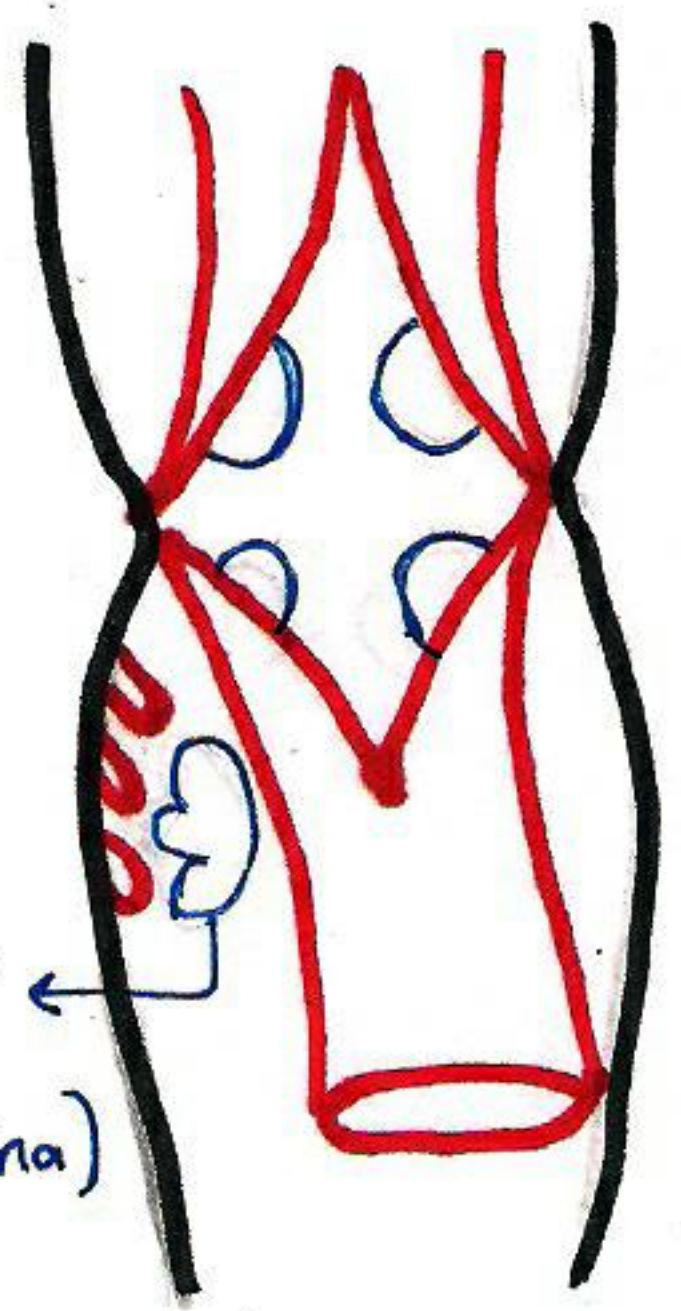
② Lateral meniscus :- circular (O-shaped).

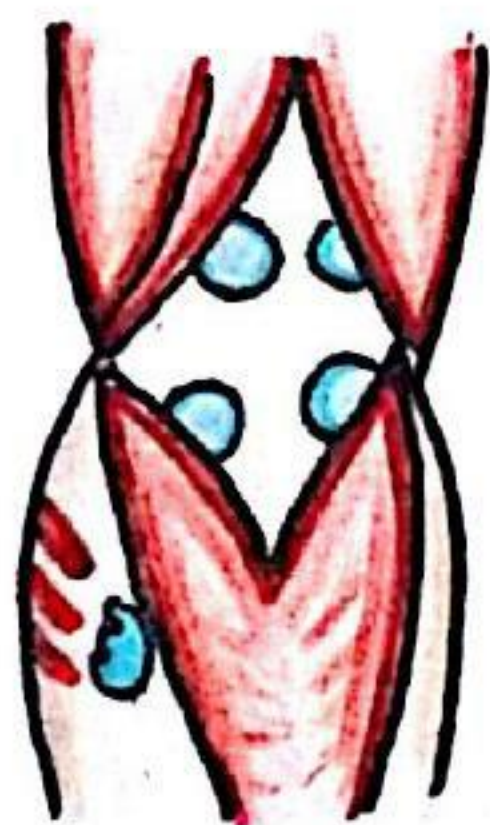
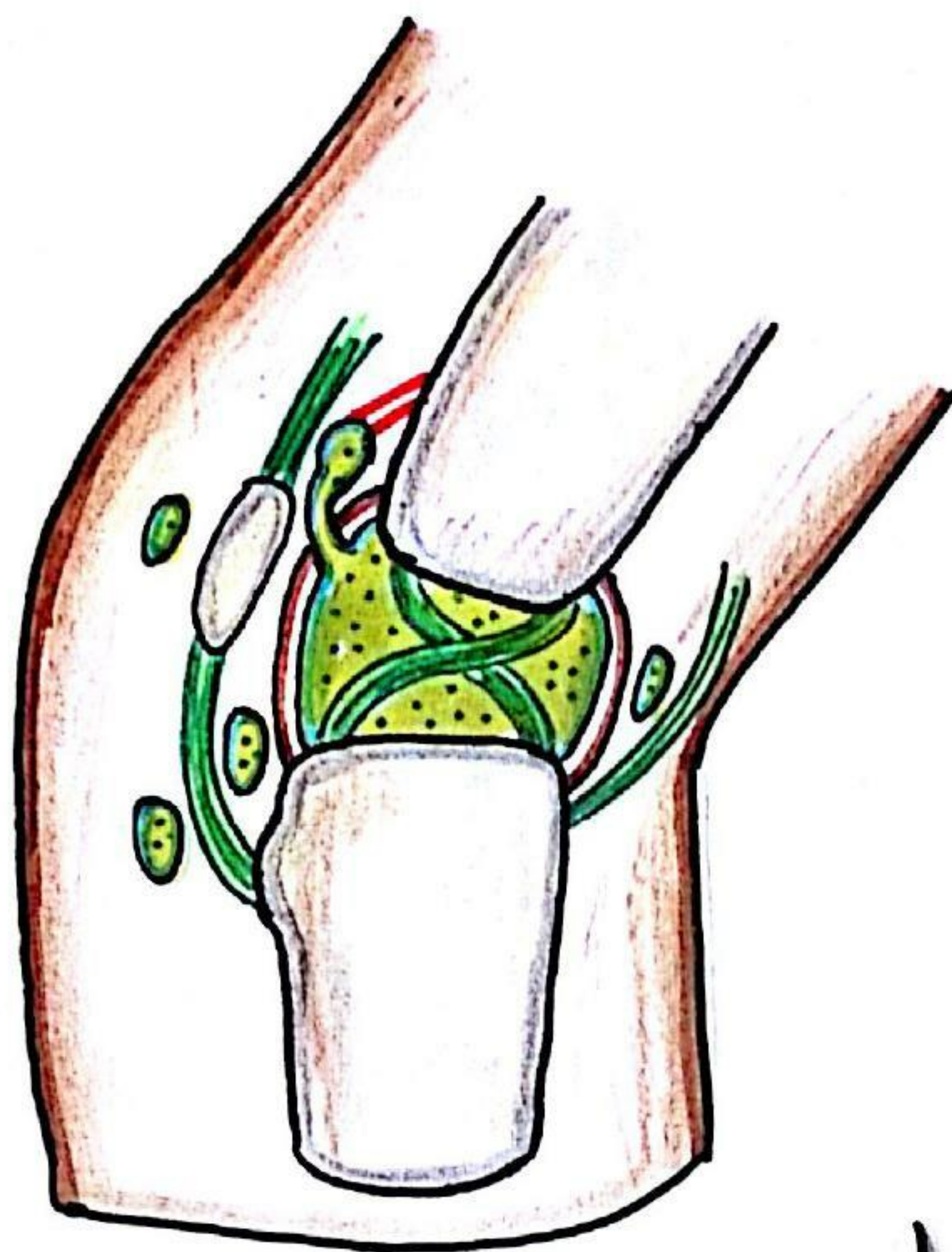
- Anterior horn : attached to ant. intercondylar area (~~is~~ ^{front} the eminence).
- posterior horn : to post. intercondylar area (behind intercondylar eminence)
- band of fibrous tissue connects post. horn to med. condyle of femur to PCL

[NB] Lateral meniscus is less exposed to injury than medial meniscus (as lat. meniscus not attached to lat. collateral lig.).

* Movement of knee joint, see later







Proximal tibio-fibular Joint:-

- * Articulation :- between lat. condyle of tibia & head of fibula
- * Type :- synovial plane, gliding (occurs during ankle movement)
- * Ligaments :- ant. & posterior lig., interosseous membrane strength joint.
- * Nerve supply :- common peroneal nerve.

Distal tibiofibular Joint:-

- * Articulation :- between fibular notch of tibia & lower end of fibula.
- * Type :- fibrous (syndesmosis) : —→ with little movement with ankle J.
- * Ligaments :- ant. & post. ligaments, interosseous membrane.
 - inferior transverse lig. :- from lateral malleolus to lower end of fibula posteriorly
- * Nerve supply :- deep peroneal & tibial nerves.

Ankle Joint:-

- * Articulation :- two malleoli, lower end of tibia, body of talus & inf. transv. lig.
- * Type :- synovial, hinge joint.
- * Ligaments :
 - ① Medial (deltoid) Lig. :- very strong, attached by:
 - apex :- to tip of medial malleolus.
 - deep fibers :- Medial surface of body of talus.
 - superficial fibers :- talus (medial surface), sustentaculum tali, tuberosity of navicular bone & Plantar calcaneonavicular lig.
 - ② Lateral lig. :- consists of :-
 - A) Ant. talo fibular lig. :- from lat. malleolus to talus (lat. surface)
 - B) Calcaneo fibular lig. :- from lat. malleolus (tip) to calcaneum (laterally)
 - C) Post. talo fibular lig. :- from lat. malleolus to talus (post. tubercle)
- * Nerve supply :- deep peroneal & tibial nerve
- * Relation :-
 - Anteriorly :- structures under extensor retinaculum (Tom has very nice dog & big.)
 - Posteriorly :- Tendocalcaneus & Plantaris.
 - Posterolaterally :- (behind lat. malleolus) → Peroneus longus & brevis.
 - Posteromedially :- (behind Med. malleolus) → (Tom dose very nice hat)
- * Movement :- see later

Subtalar Joint :-

- * Articulation:- body of talus (inf. surface) & calcaneum (on middle of upper surface)
- * Type:- synovial, plane variety (gliding & rotation; inversion & eversion).
- * Ligaments:- Medial & lateral talocalcaneal ligaments.
 - Interosseous talocalcaneal lig. : from sulcus tali to sulcus calcanei (sinus tarsi)

Midtarsal (transv. tarsal) Joints :-

1. Talocalcaneo-navicular Joint :-

- * Articulation:- between head of talus, upper surface of sustentaculum tali & post. surface of navicular bone.
- * Type:- synovial, ball & socket (gliding & rotation, inversion & eversion).
- * Ligaments:- Plantar calcaneonavicular lig. (spring lig.) :- from ant. margin of sustentaculum tali to inf. surface of the tuberosity of navicular.

2. Calcaneocuboid Joint :-

- * Articulation:- between anterior end of calcaneum & cuboid (post. surface)
- * Type:- synovial, plane variety.
- * Ligaments:-
 - ① Bifurcated lig. :- Y-shaped, ~~from~~ attached by:
 - stem : to calcaneum (upper surface of ant. part).
 - lat. limb : to cuboid (upper surface).
 - Med. limb :- to navicular (upper surface).
 - ② Long plantar lig. :- from calcaneum (undersurface) to cuboid (undersurface) & bases of 3rd, 4th & 5th metatarsal
 - ③ Short plantar lig. :- from calcaneal tubercle to cuboid.

* Movements of subtalar & transverse tarsal :- see later

Cuneonavicular Joint :-

* Articulation :- between navicular & 3 cuneiform bones

* Type :- synovial plane variety, gliding.

* Ligaments: dorsal & plantar.

* N.B - Its joint cavity is continuous with those of

① intercuneiform joints, ②-cuneocuboid joint

③-cuneometatarsal J. ④-intermetatarsal joints of 2nd → 4th M.T.

Others :-

* Ideonavicular joint:- usually fibrous with dorsal, plantar & interosseous lig.

* Cuneiform & cuneo-cuboid joints:- synovial plane, with D.P. & inteross. lig.

* Metatarsal & intermetatarsal joints:- synovial plane, with " " "

(N.B → tarsometatarsal joint of big toe has a separate joint cavity).

* Metatarsophalangeal & interphalangeal Js:- (MTPJs & IPJs)

-MTPJs are synovial condyloid but IPJs are synovial hing.

Movements of joints of L.L.

Movements of hip joint :-

- * Flexion :- iliacus, psoas, sartorius, rectus femoris & adductor ms.
- * Extension :- Gluteus maximus, biceps femoris (long head), semitendinosus & semimembranosus.
- * Abduction :- Gluteus medius & minimus, sartorius, piriformis & tensor fasciae latae.
- * Adduction :- Adductor longus, brevis & magnus (adductor portion ^{pubic part}), pectineus & gracilis.
- * Lateral rotation :- obturator internus & externus, gemellus sup. & inferior, piriformis, quadratus femoris, sartorius & gluteus maximus.
- * Medial rotation :- Gluteus minimus & medius (ant. fibers), tensor fascia lata.
- * Circumduction :- combination of the above.

Movements of knee joint :-

- * Flexion :- semitendinosus, semimembranosus, biceps femoris, gracilis, sartorius (SGS), popliteus.
- * Extension :- Quadriceps femoris.
- * Medial rotation :- semimembr., semitend., gracilis, sartorius (SGS)
- * Lateral rotation :- biceps femoris

NB :- Med. & lat. rotation occur when knee flexed.

* Locking & unlocking of knee joint :-

- During full extension of knee, femur rotates medially → this screws femur on tibia → tightens ligaments → locks the knee.
- flexion begins with lat. rotation of femur by Popliteus → unlocking the knee & flexion proceeds.

Movements of ankle joint :-

- * Dorsiflexion (extension) :- by ms. of ant. leg. compartment
 - * plantar flexion (flexion) :- by ms. of post & lateral leg compartment
- Tibialis ant.
 E. digitorum L.
 E. hallucis L.
 Peroneus tertius
- lat. comp. → peroneus longus & brevis
 - Post. comp. → superf. gp → gastrocnemius, plantaris, soleus
 - ↓
 - deep gp → tibialis post., FHL, FDL.
- except popliteus

* Movement of subtalar & transverse (mid) tarsal :-

* Inversion :-

- tibialis anterior, tibialis posterior.
- extensor hallucis longus.
- extensor digitorum longus (medial tendons).

* eversion :-

- Peroneus longus, brevis & tertius.
- extensor digitorum longus (lateral tendons).

- Joints of lower limb.

JOINT	articulation	type	capsule & synovial m.	Ligaments	N. supply
- Hip joint	• between head of femur & acetabulum. • acetabulum deepened by fibro-cartilaginous rim (acetabular labrum). [NB] - acetabular labrum bridges acetabular notch forming transverse acetabular ligament.	Synovial ball & socket (polyaxial)	- encloses the joint • <u>Medially</u>: attached to acetabular labrum. • <u>Laterally</u> in front to intertrochantric line & behind to middle of neck posteriorly * <u>Psoas bursa</u> protrude from syn. membrane through capsule.	① iliofemoral lig. (Y-shaped) - bet. A.I.S & intertroch. line. ② Pubo femoral lig. (Δ shaped) - bet. sup. pubic ramus & intertrochantric line. ③ - ischio femoral (spiral) - bet. ischium & greater trochanter ④ - transverse acetabular lig. ⑤ - lig. of HOF (Δ shaped) bet. fovea capitis & margin of acetabular notch	- femoral - obturator - sciatic - N. to quad. femoris
- Knee joint	- femoral condyles. - tibial condyles - patella (with femur) - [Mensci] [fibrocart. disc. to deepens surface]. - Medial meniscus C-shaped - lat. meniscus: O-shaped	Synovial modified hinge	- attached to margin - Bursa related are ① prepatellar bursa ② suprapatellar ③ superf. infrapatellar ④ - deep infrapatellar ⑤ - popliteal bursa ⑥ - bursa of med. head of gastrocnemius ⑦ - bursa of lat. head of gastrocnemius ⑧ - bursa of biceps tendon ⑨ - semimembranosus bursa ⑩ - bursa anserina (Grouse foot) under SGS (sartorius, gracilis, semitend.)	I - Extra Capsular Lig:- ① - ligamentum patellae → bet. patella & tibial tuberosity. ② - lat. collateral lig. → bet. lat. condyle of femur & head of fibula. ③ - Med. collateral → bet. Med. femoral condyle & tibia shaft ④ - oblique popliteal lig → it is extension of semimemb. tendon II - Intracapsular lig:- ① - transv. lig. - between ant horns of menisci (M.L) ② - cruciate lig. - A - ant. cruciate lig. (ACL) - B - post. cruciate lig. (PCL)	- femoral - obturator - Tibial N. - common peroneal.

CLINICAL NOTES ON LOWER LIMB

* Arterial Pulsation :-

- Femoral artery is felt at mid inguinal point (bet. ASIS & symphysis)
- Popliteal artery is felt in popliteal fossa with knee flexed.
- Anterior tibial is felt Midway between two malleoli (anteriorly)
- Posterior tibial is felt just behind medial malleolus.
- Dorsalis pedis a is felt just lateral to extensor hallucis ^{tendon.} longus

* Tendon reflexes :-

- Achilles tendon reflex (ankle jerk) $\rightarrow$ S₁ & S₂.
- Patellar tendon reflex (knee jerk) $\rightarrow$ L₃ & L₄ (or L_{2,3,4})

* Femoral nerve injury :-

- injury by gunshot, stab wound, --- etc
- effects $\rightarrow$ Motor:- quadriceps paralysis $\rightarrow$ loss of knee extension by it.
Sensory:- loss sensation at anterior & medial side of thigh & along saphenous nerve (medial side of leg & medial side of foot up to ball of big toe).

* Obturator nerve injury :-

- injury by penetrating wound, gunshot, --- etc (labour) ^{fetal head}
- effects $\rightarrow$ Motor :: paralysis of adductor muscle (except hamstring portion of adductor magnus.
Sensory : minimal loss of sensation at medial aspect of the thigh.

* Sciatic nerve injury :-

- injury frequently by badly placed intramuscular injections in gluteal region, but may be by fracture pelvis,etc
- effects :
 - Motor :- loss of flexion of knee (except by sartorius and gracilis) & paralysis of all ms below knee.
 - Foot drop (plantar flexion position).
 - Sensory :- loss of sensation below knee (below knee anaesthesia) except area supplied by the saphenous nerve.
- Sciatica :- condition in which patients feel pain along sensory distribution of sciatic nerve.
 - caused by intervertebral disc prolapse pressing the sacral plexus, pelvic tumour, inflamed nerve,etc

* Common Peroneal N. injury :-

- injury frequently by fracture of neck of fibula & by pressure from casts or splints
- effects :
 - Motor :- paralysis of ant. & lateral compartment of leg → Plantar flexion & inversion by opposing muscles → equinovarus (plantar flexion & inversion)
 - Sensory :- loss of sensation along cutaneous distribution of superficial, deep & common peroneal nerves.

* Tibial Nerve injury :-

- effects - Motor , paralysis of muscles of back of leg & sole of foot → dorsiflexion & eversion by opposing muscles → calcaneo-valgus (dorsiflexion & eversion).

* Flat foot :- (Pes planus)

- Loss of normal arches of foot especially medial long. arch.
normal < 2 years.

* high arch foot (Pes cavus)

- exaggerated arch ($\uparrow$ arch) $\rightarrow$ very rare.

* Dislocation of hip :-

(A) Congenital dislocation of hip (CDH) :- occur in 1:1000 newborns more in female (6:1 = $\text{♀}:\text{♂}$)

if occur bilateral (in $\frac{1}{3}$ of cases) $\rightarrow$ waddling gait and causes positive Trendelenburg's sign.

(B) Traumatic dislocation of hip :- head of femur usually dislocate posteriorly.

* Fracture neck of femur : (*NOF)

- occurs commonly in old age by slipping.
- It can cause a vascular necrosis of head of femur due to cut of blood supply.

NOTES ON LOWER LIMB :-

- Adductor hiatus :- contains femoral vessels, lymph vessels (connecting popliteal & deep ing. LN) and post. division of obturator nerve.
- Structures related to ischial spine are:-
 - Sciatic N., Pudendal N. & vessels, Nerve to obt. internus and superior gemellus muscle.
- Quadriceps muscle :- consists of rectus femoris & 3 vasti.
 - the deepest is vastus intermedius.
 - rectus femoris crosses 2 joints & perform ^{hip} flexion & ^{knee} extension.
- Gluteus maximus is the largest muscle of body.
- Sartorius muscle known as ^{tailor} muscle
- Soleus is the first gear muscle & contains peripheral heart.
- Popliteus has action at its origin.
- Tibialis posterior attached to navicular tuberosity & all tarsal bone except talus.
- The sesamoid bone over first metatarsal bone lies inside tendon of FHB (flexor hallucis brevis).
- Tendocalcaneus is the strongest tendon in the body.
- Iliofemoral ligament is " ligament " " lower.

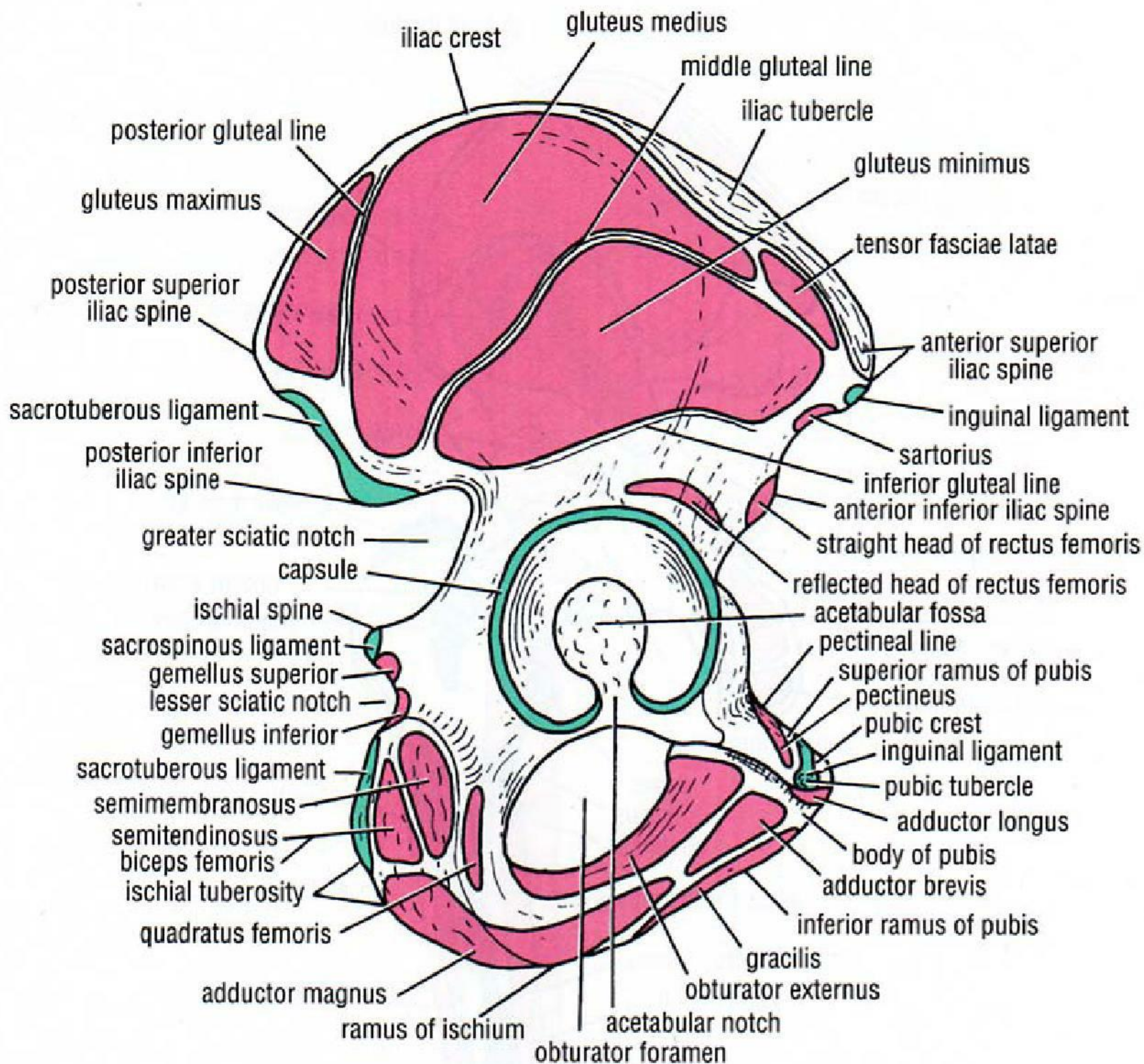


Figure 10-4 Muscles and ligaments attached to the external surface of the right hip bone.

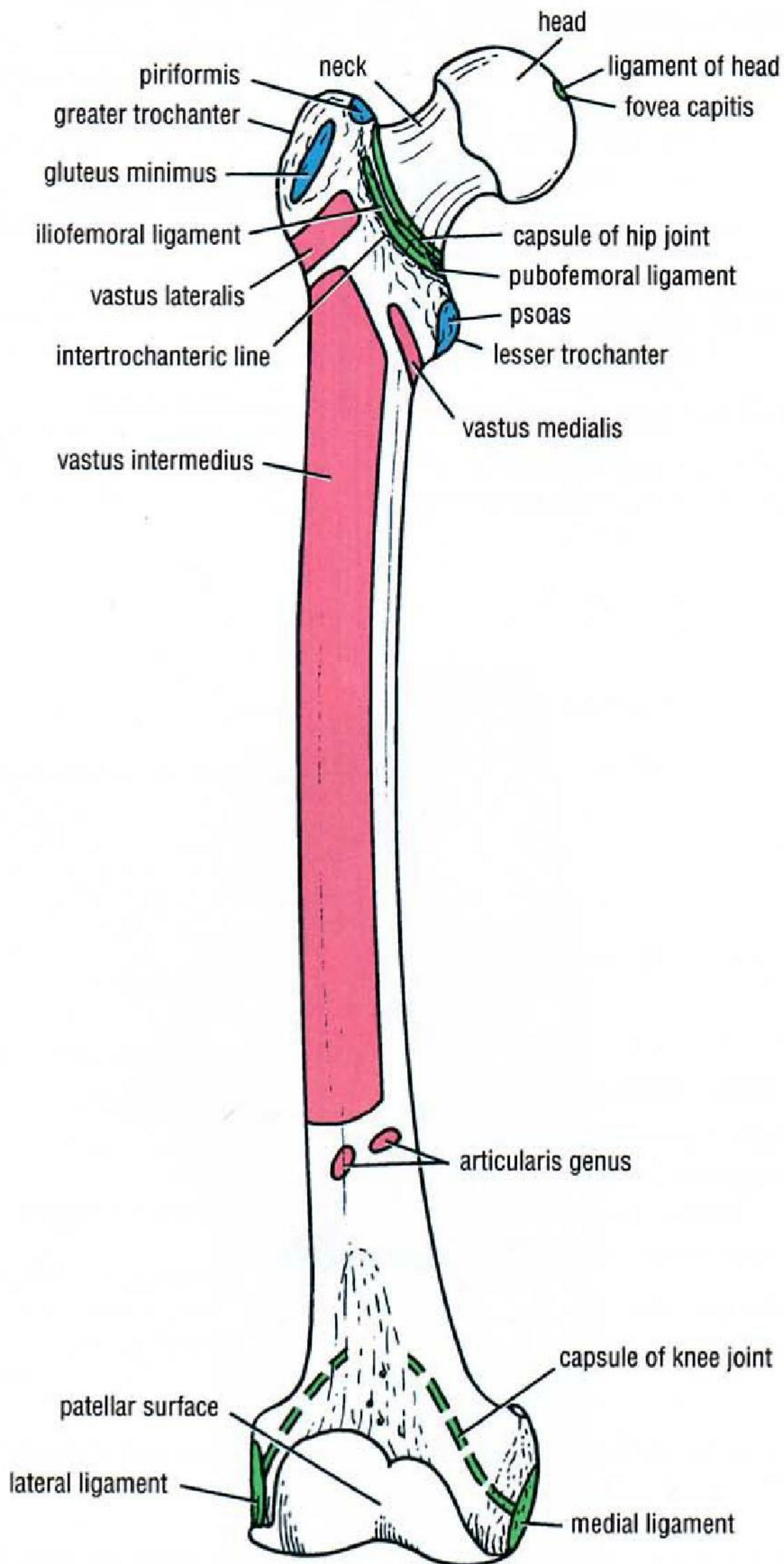


Figure 10-6 Muscles and ligaments attached to the anterior surface of the right femur.

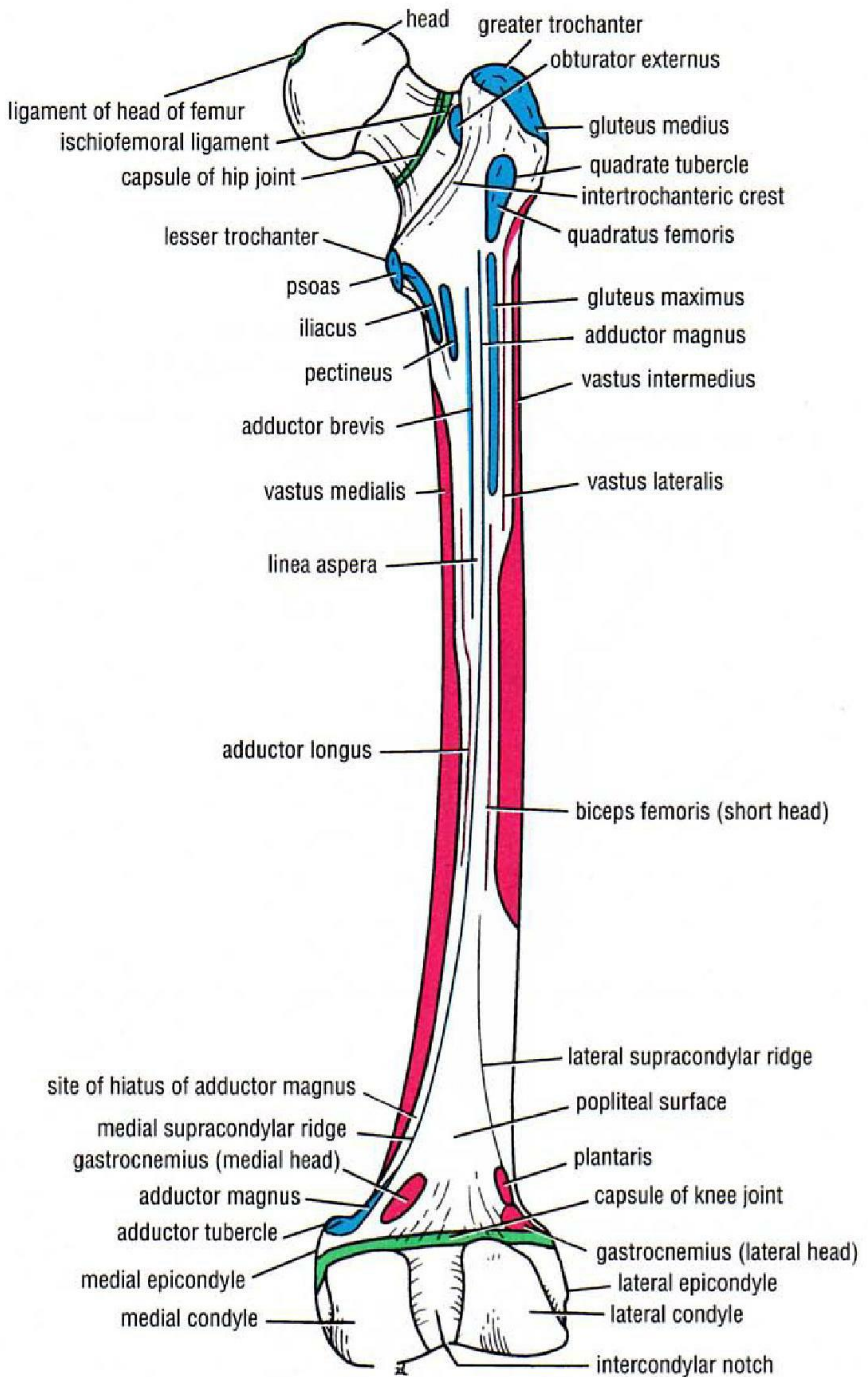


Figure 10-7 Muscles and ligaments attached to the posterior surface of the right femur.

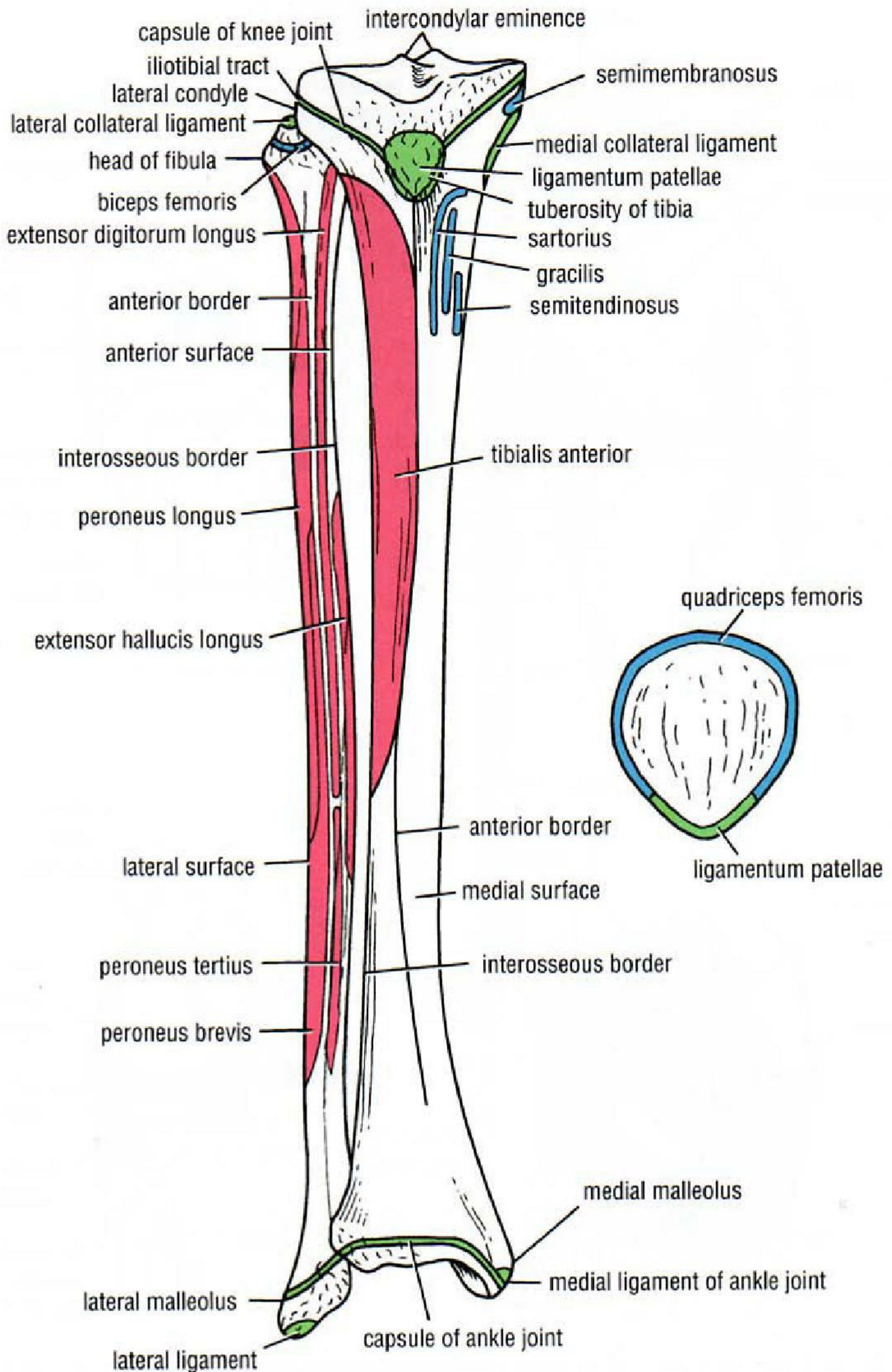


Figure 10-34 Muscles and ligaments attached to the anterior surfaces of the right tibia and fibula. Attachments to the patella are also shown.

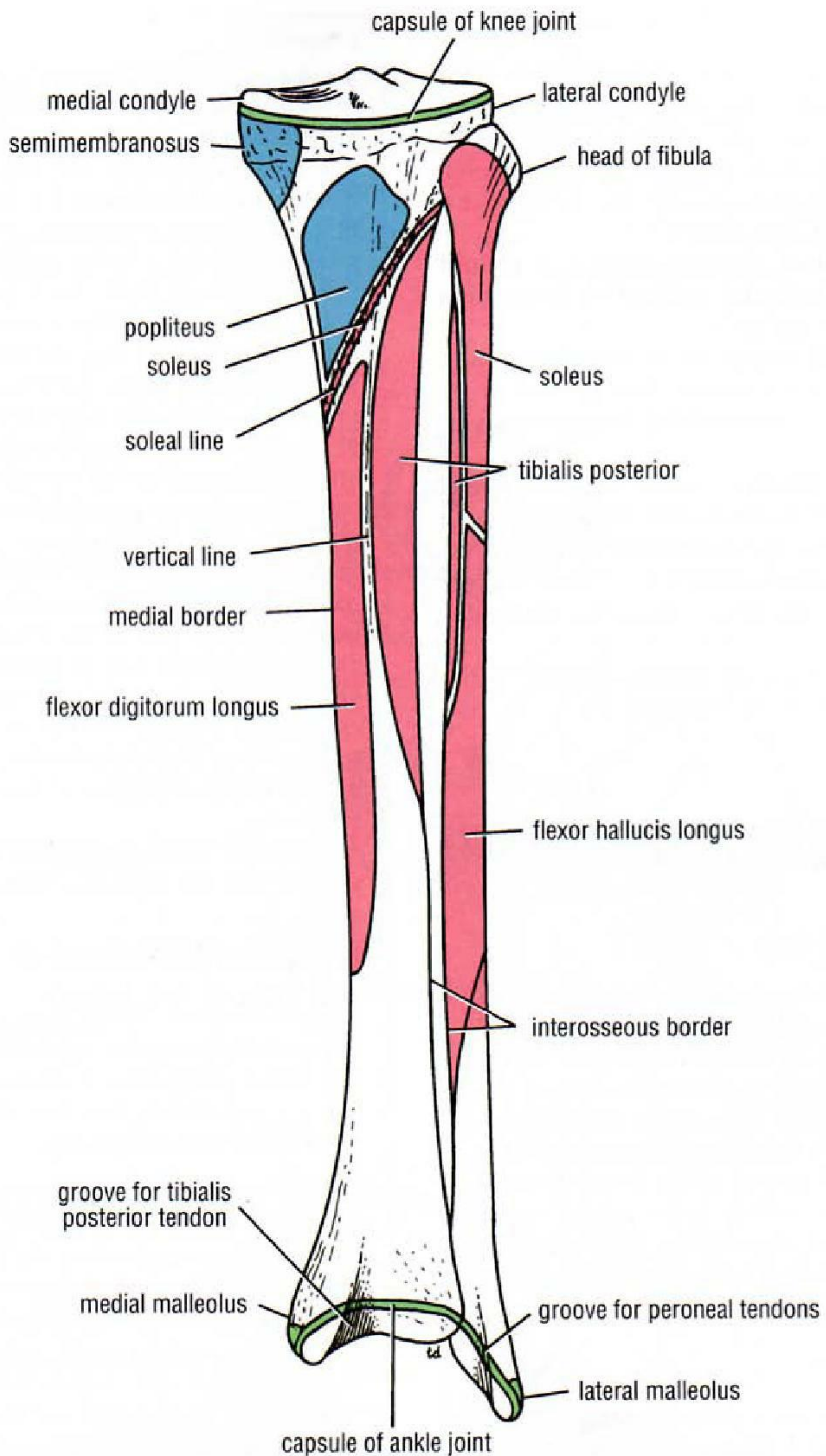


Figure 10-36 Muscles and ligaments attached to the posterior surfaces of the right tibia and the fibula.

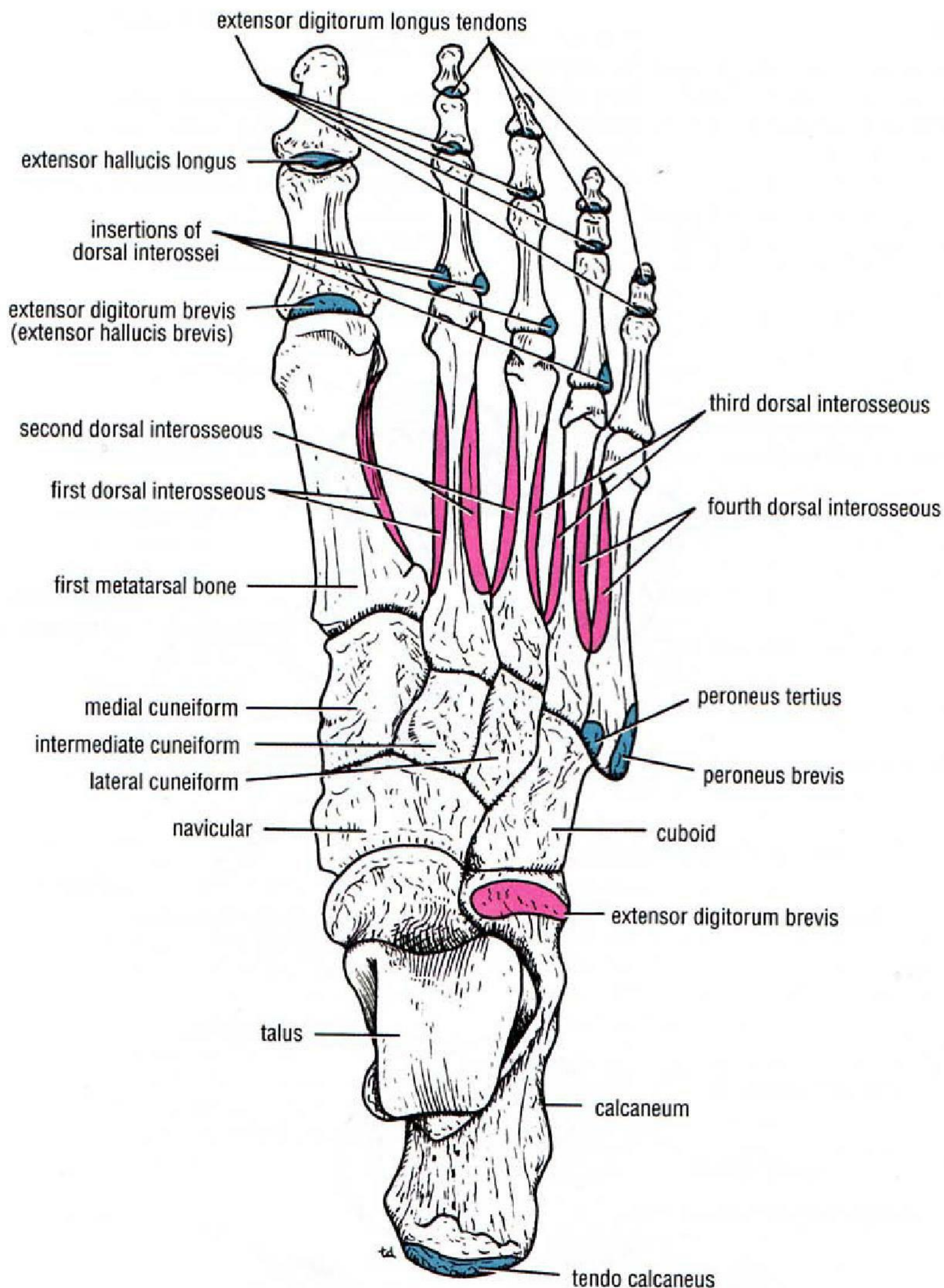


Figure 10-38 Muscle attachments on the dorsal aspect of the bones of the right foot.

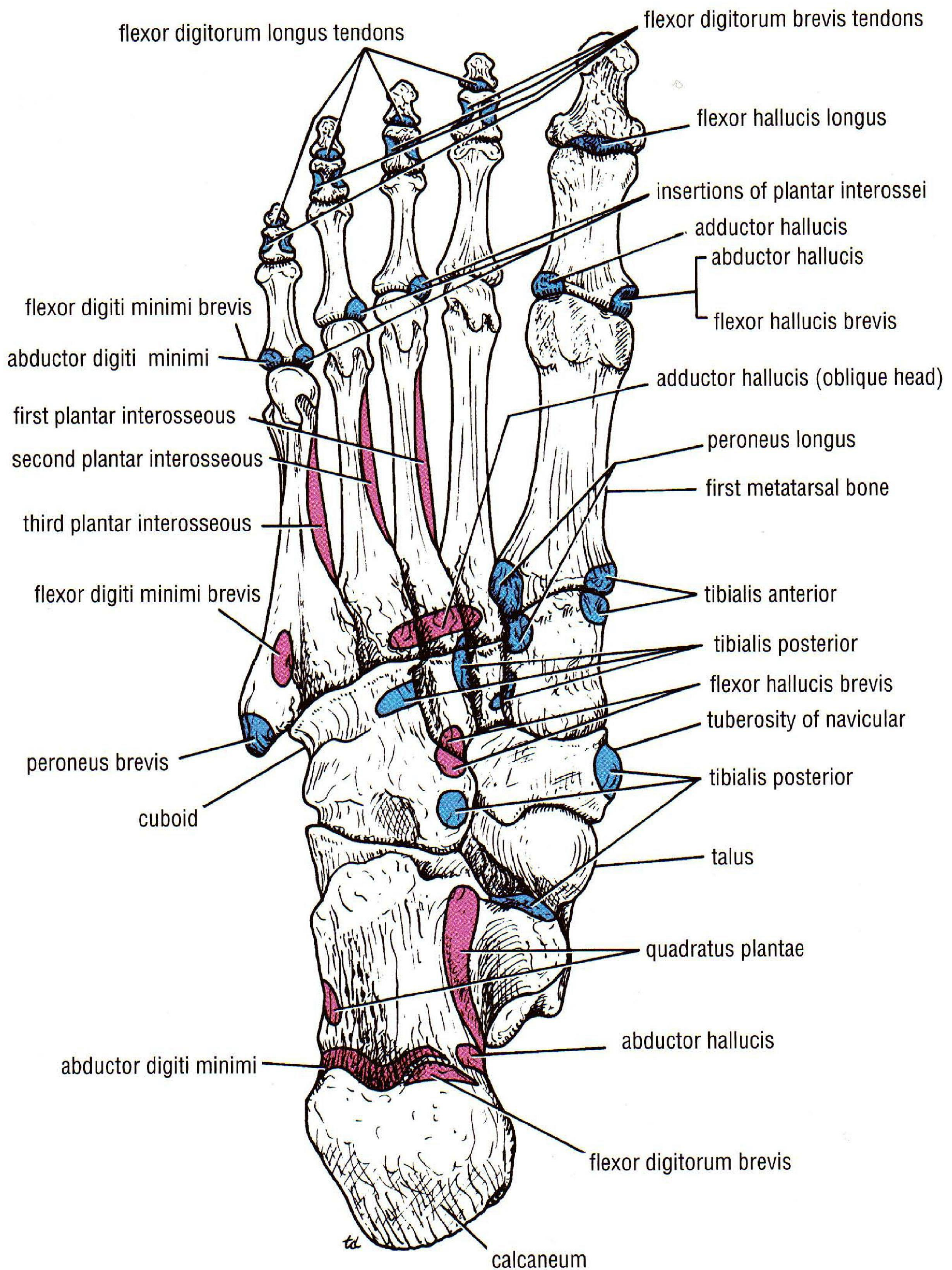


Figure 10-39 Muscle attachments on the plantar aspect of the bones of the right foot.



Fig.(358): TRANSMISSION OF BODY WEIGHT IN ERECT POSTURE

In the erect position, the body weight is transmitted from the vertebral column to the sacro-iliac joints of both sides and then to the 2 hip joints. In the lower limb the body weight is transmitted from the head of femur to its 2 condyles especially the lateral condyle. It is then transmitted through the tibia (not the fibula) down to the talus where the weight is distributed forwards to the fore-part of the foot and backwards to the back-part of the foot (calcaneus).

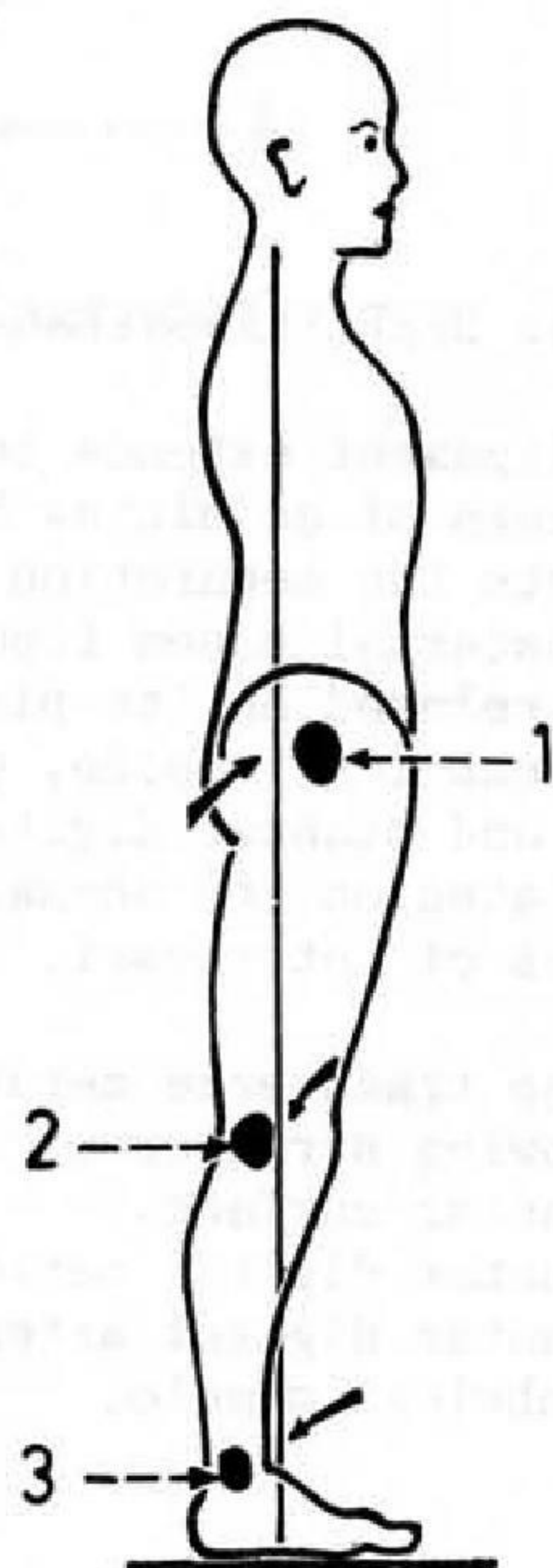


Fig.(359): CENTRE OF GRAVITY IN THE UPRIGHT POSITION

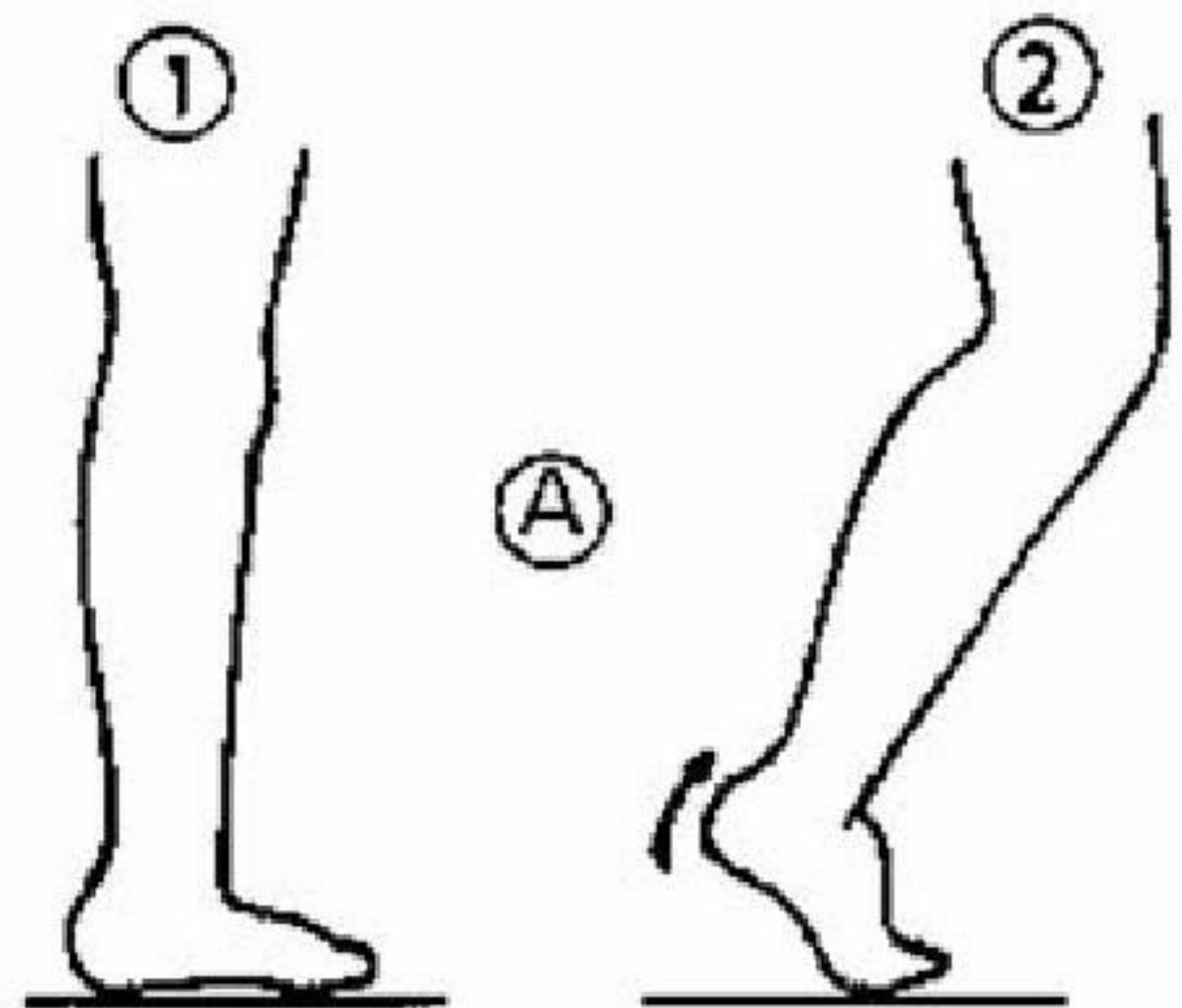
In the upright position, the centre of gravity passes slightly behind the 2 hip joints (1). This allows the trunk to be extended on the lower limbs, a position which is resisted by the iliofemoral ligaments. At the knee joint the centre of gravity passes slightly in front of the joint (2). This leads to hyperextension of the knee joint, a position which is resisted by the cruciate ligaments and the oblique popliteal ligament of the knee. Lower down, the centre of gravity falls slightly in front of the ankle joint (3). The body tends to fall forwards at the ankle joint, but this is resisted by contraction of the superficial muscles of the calf.

MECHANISM OF WALKING

Walking movement consists of a series of steps which follow one another. A complete step consists of 2 phases which follow each other in succession: the 1st phase is called stance phase, i.e. the phase with the limb on the ground, and the 2nd phase is called swing phase, i.e. the limb is off the ground and is propelled forwards.

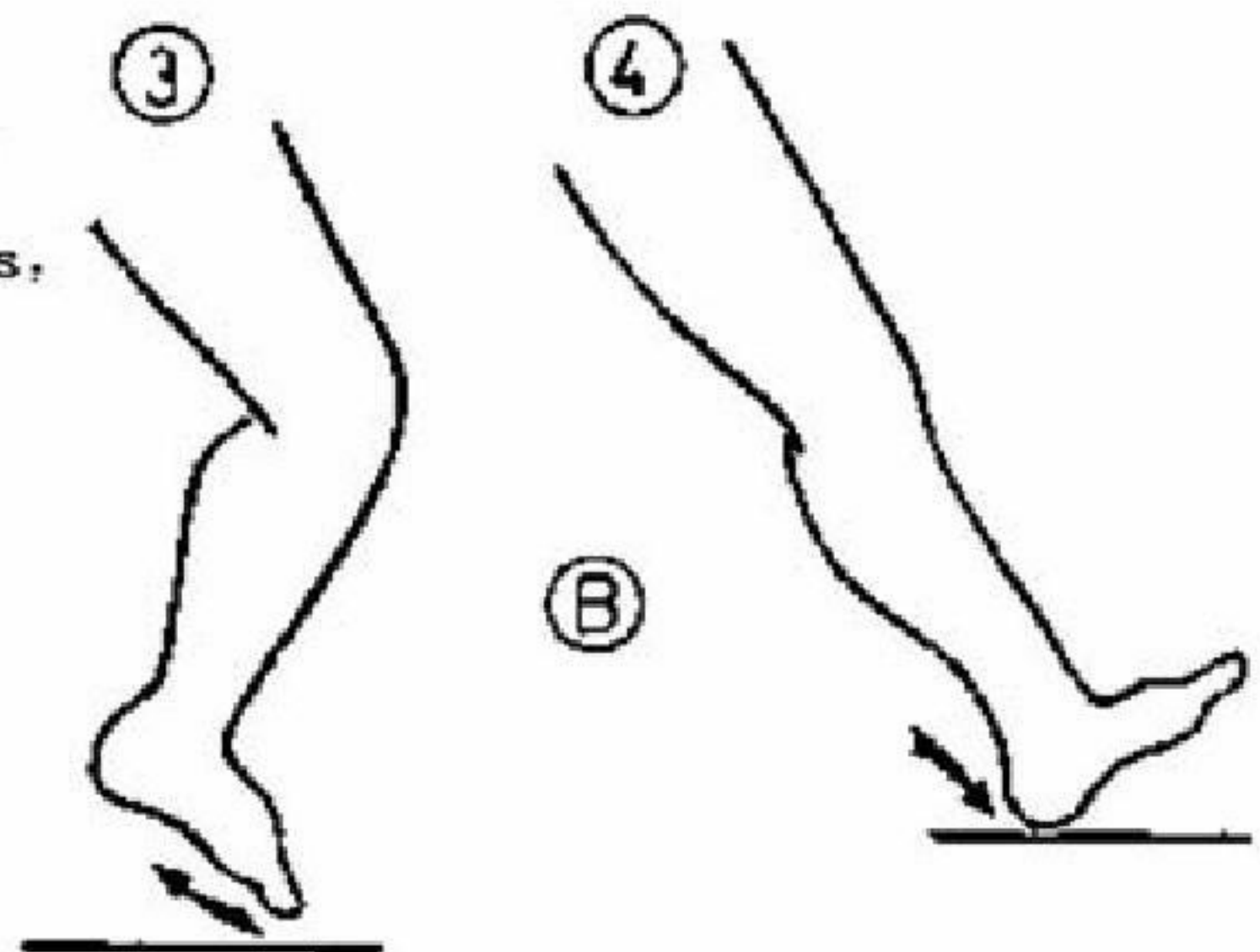
(A) Stance phase:

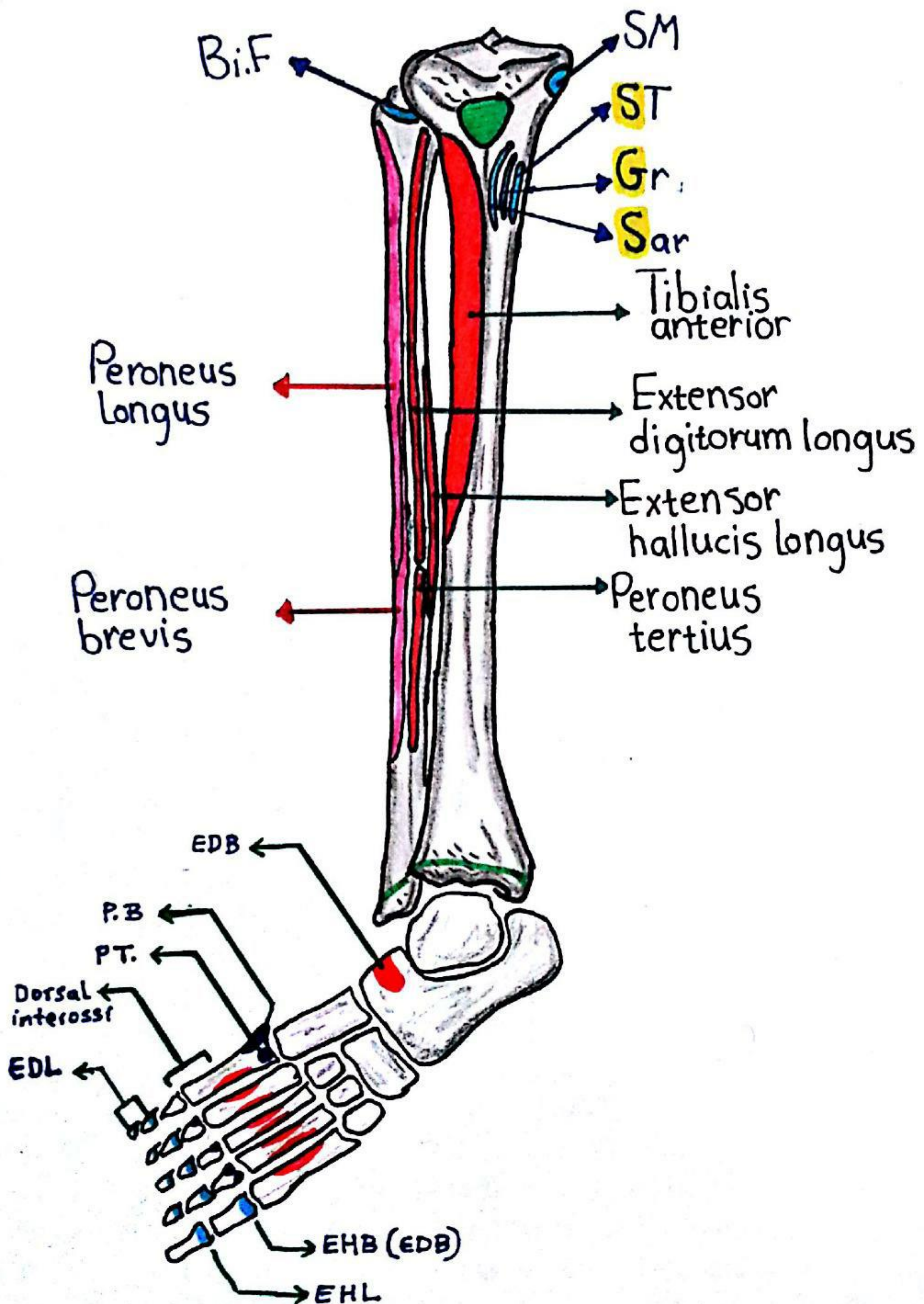
This phase starts by the foot resting on the ground and is weight bearing (1). The heel is then elevated (2) but the toes are still in contact with the ground.

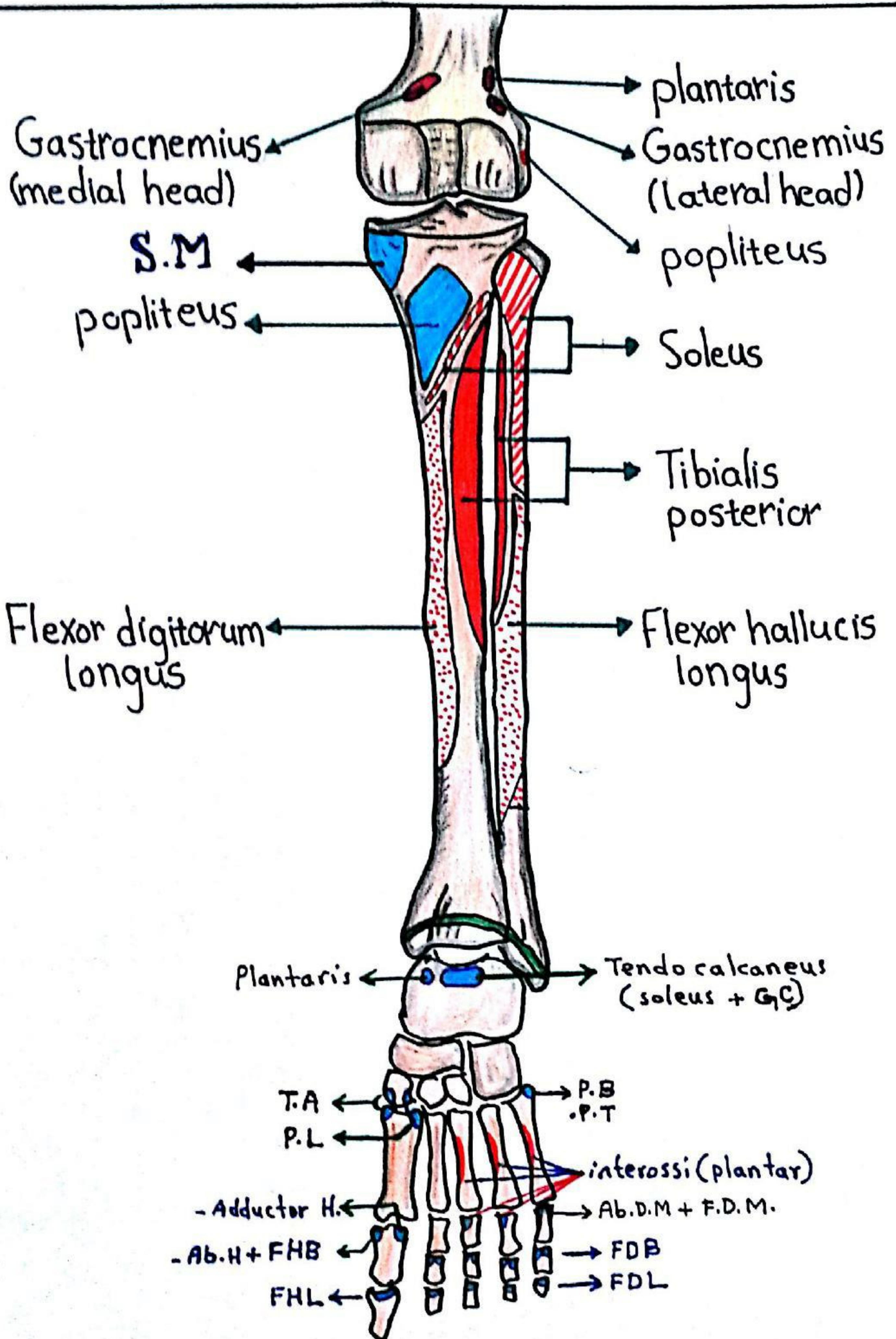


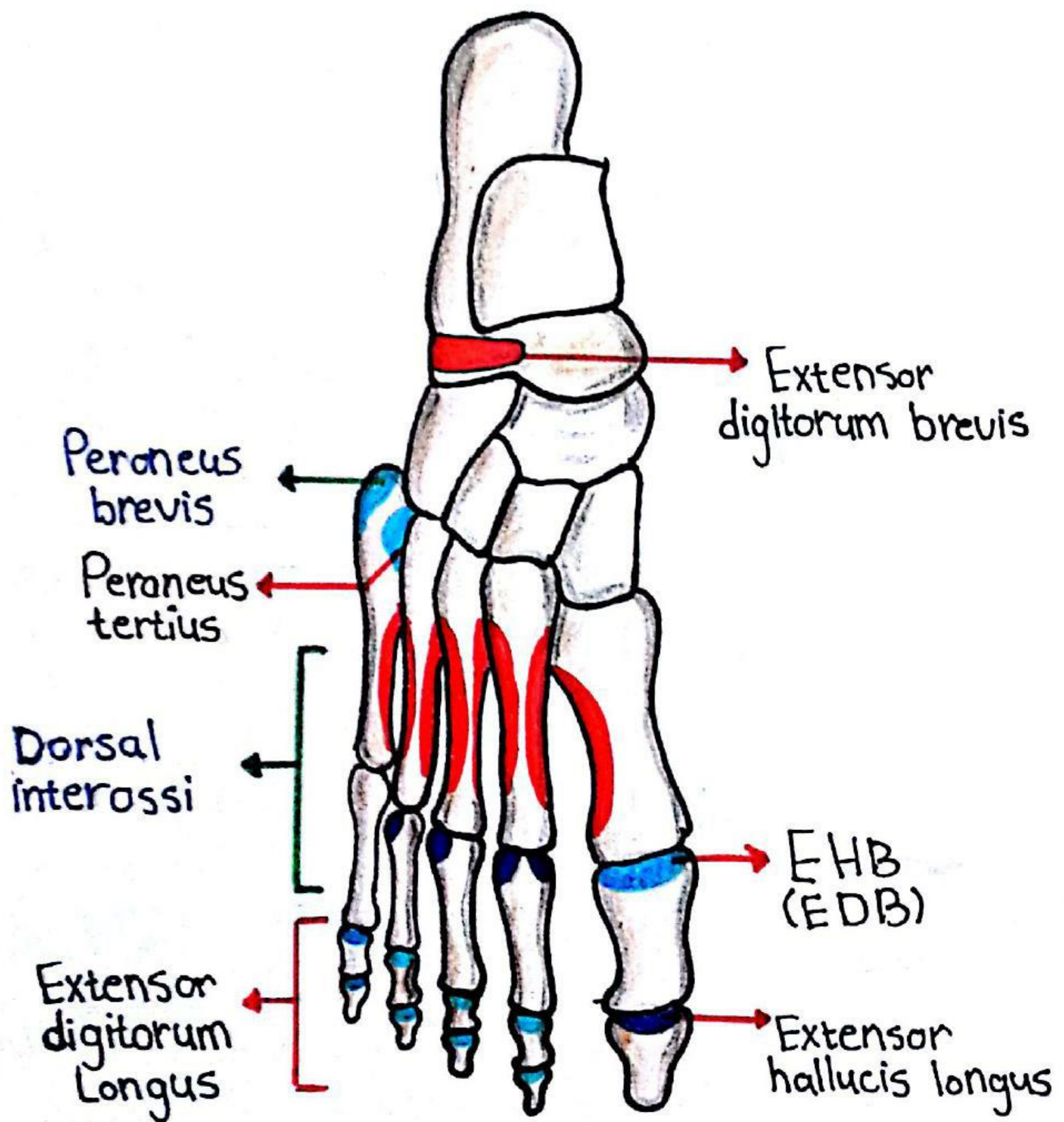
(B) Swing phase:

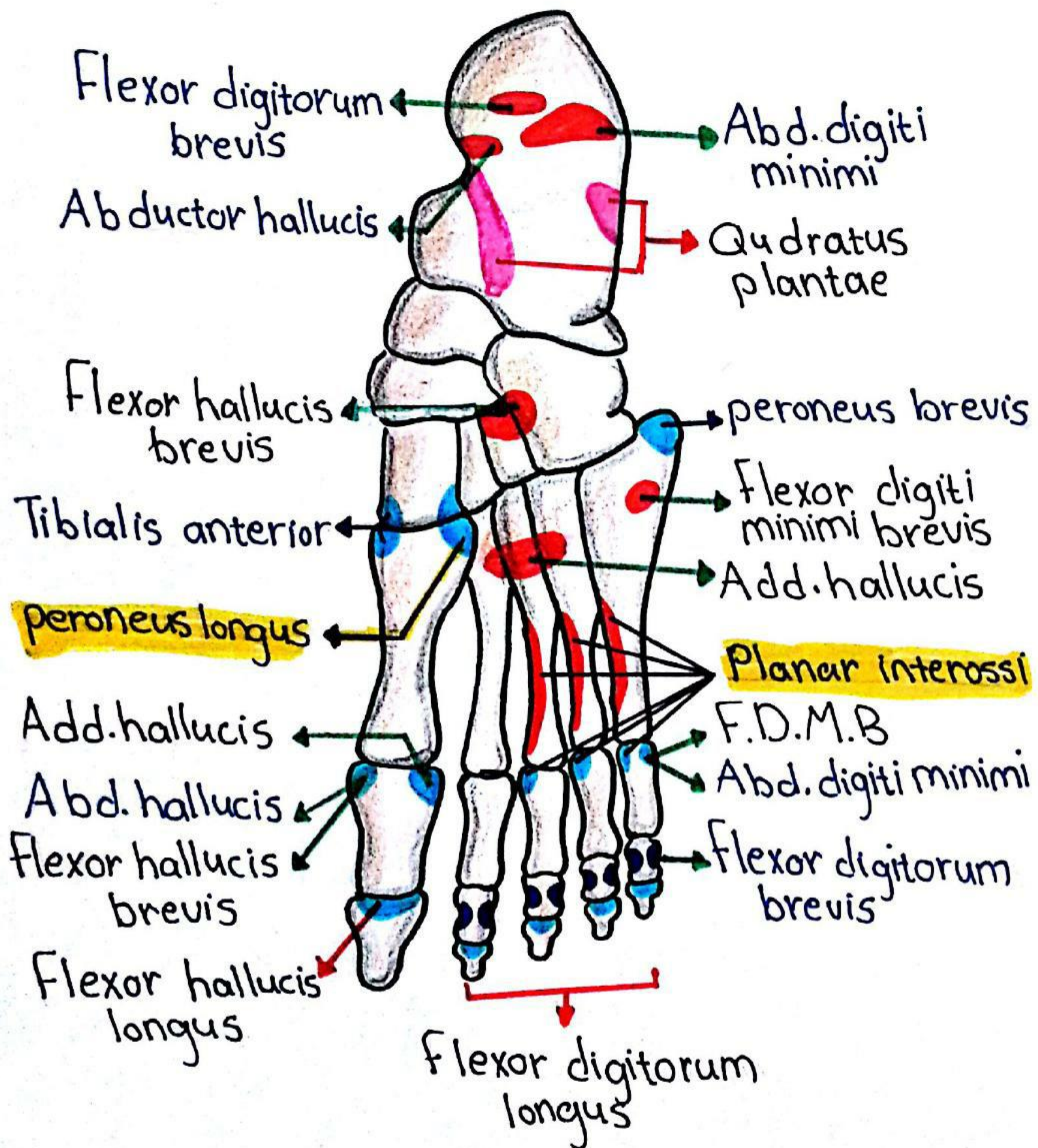
This phase starts by elevation of the toes from the ground, i.e. toe-off (3). The leg is then propelled forwards, i.e. it swings, and the phase ends by bringing the heel in contact with the ground, i.e. heel-strike (4).

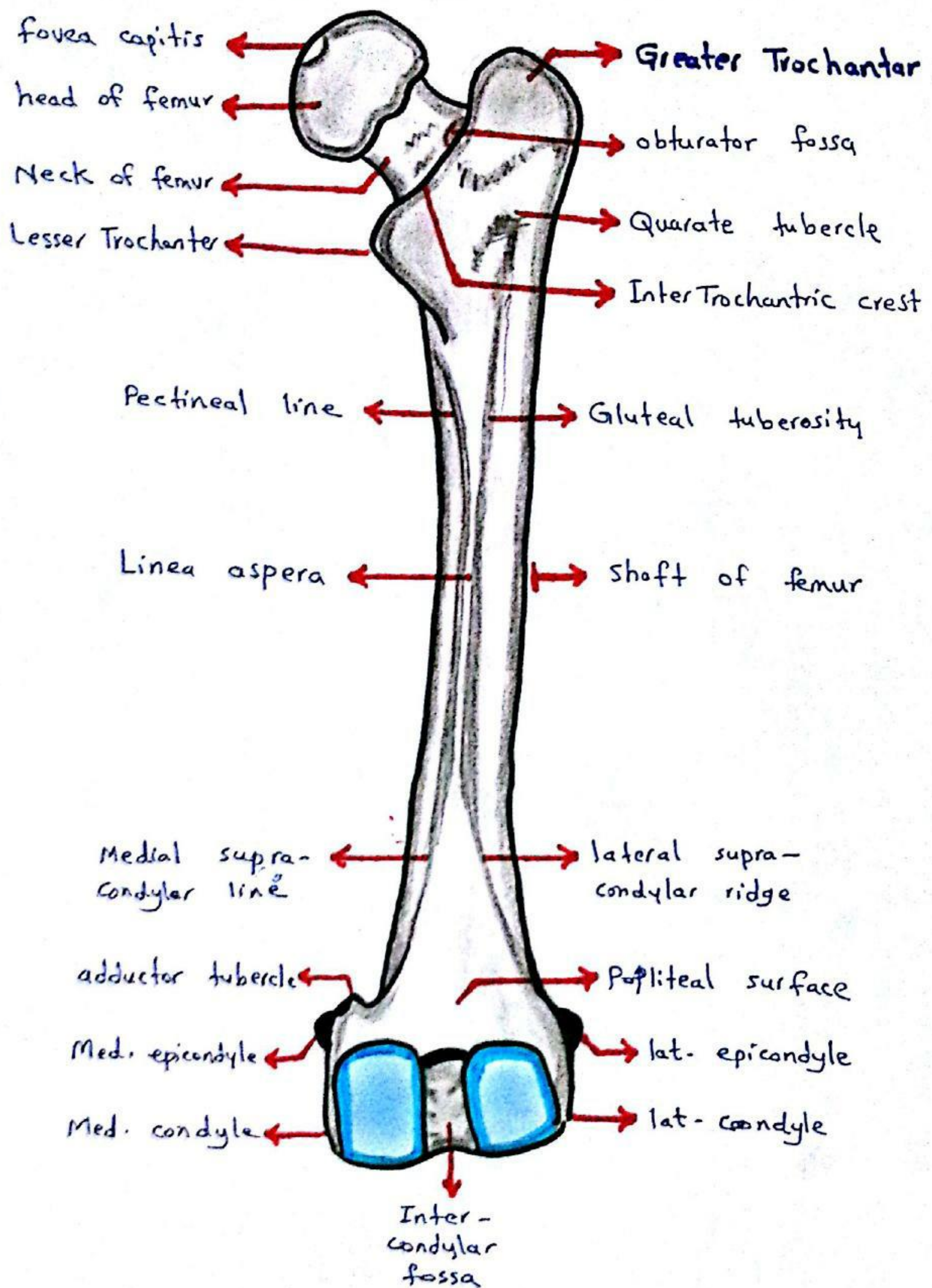




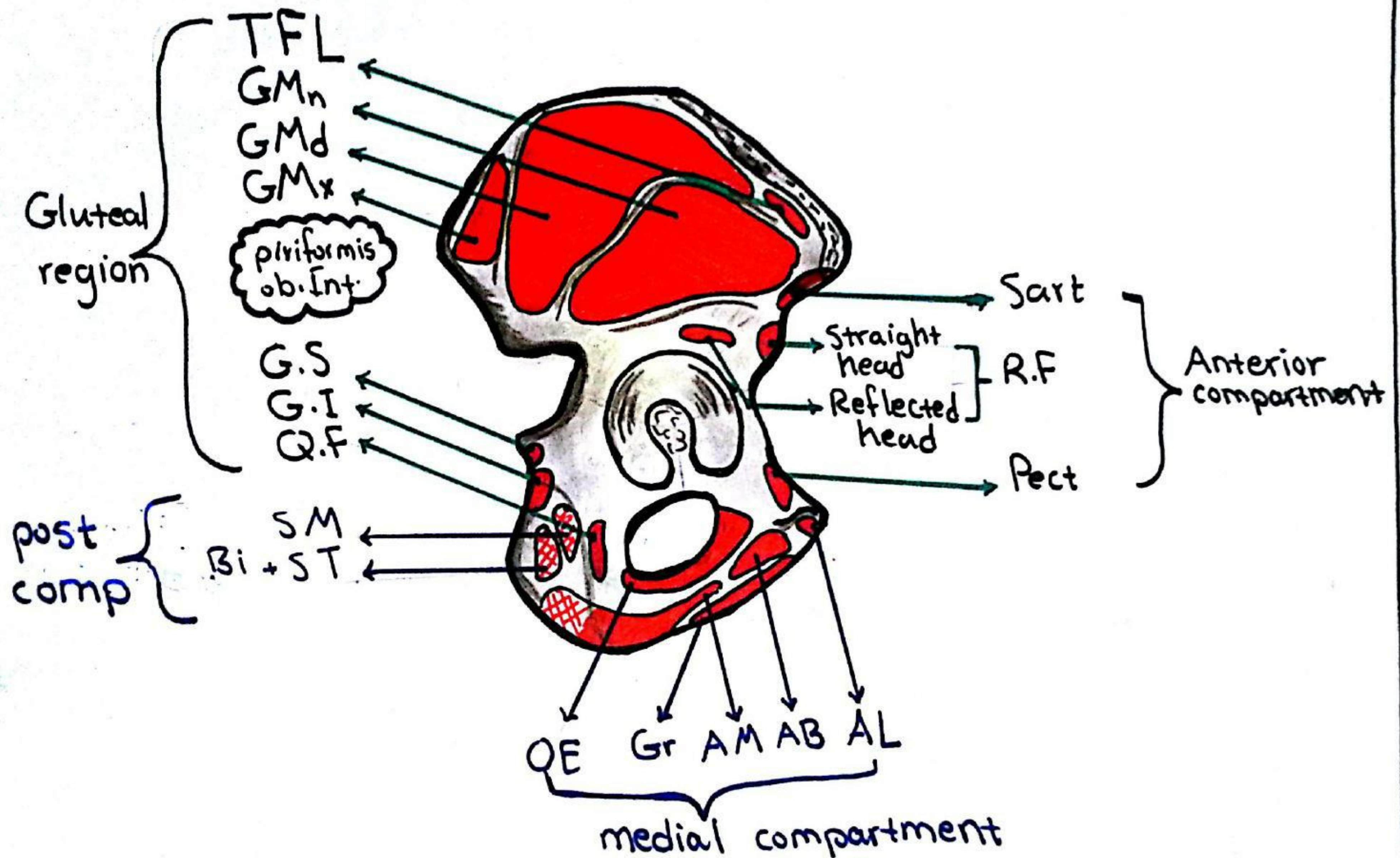


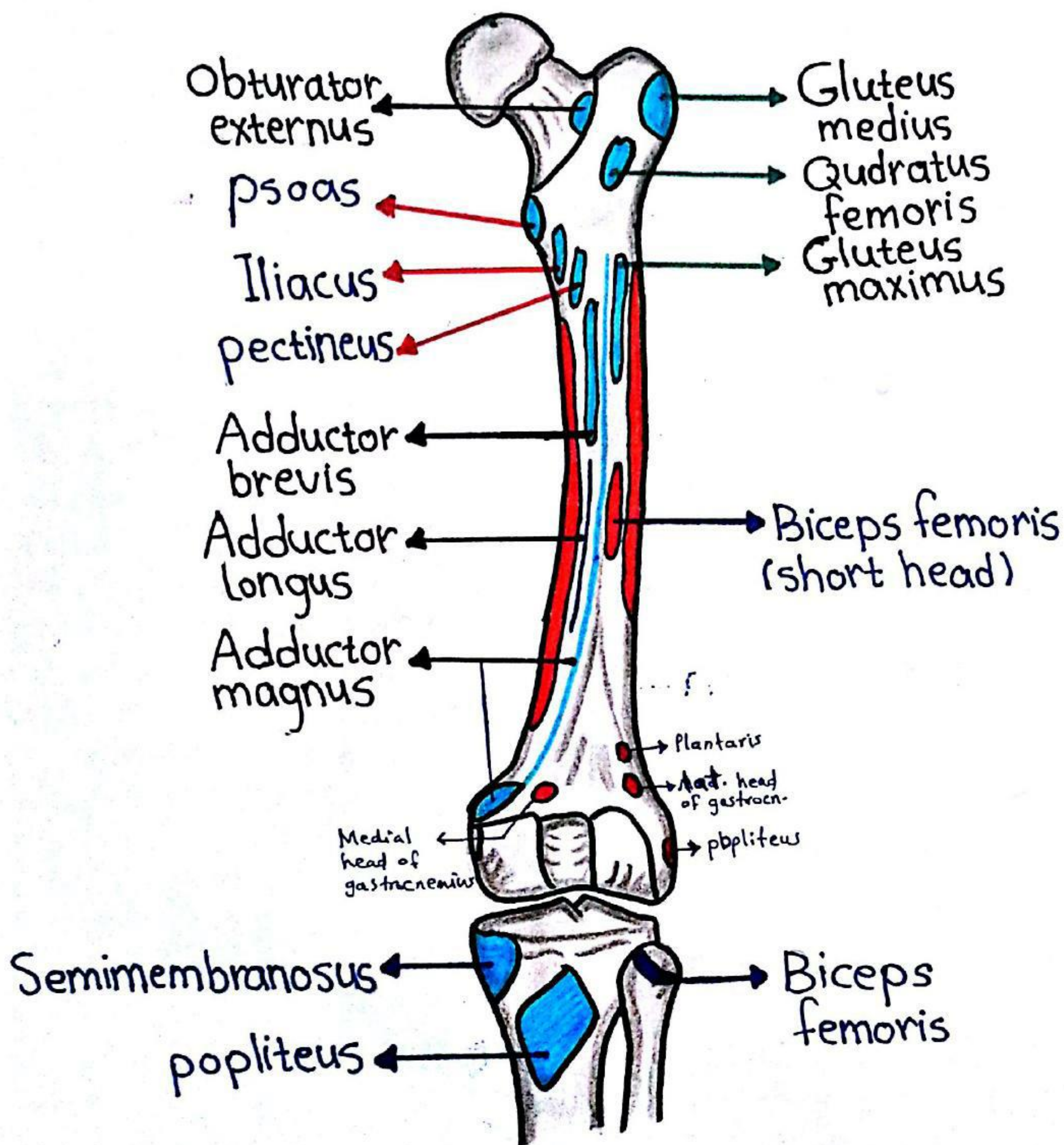


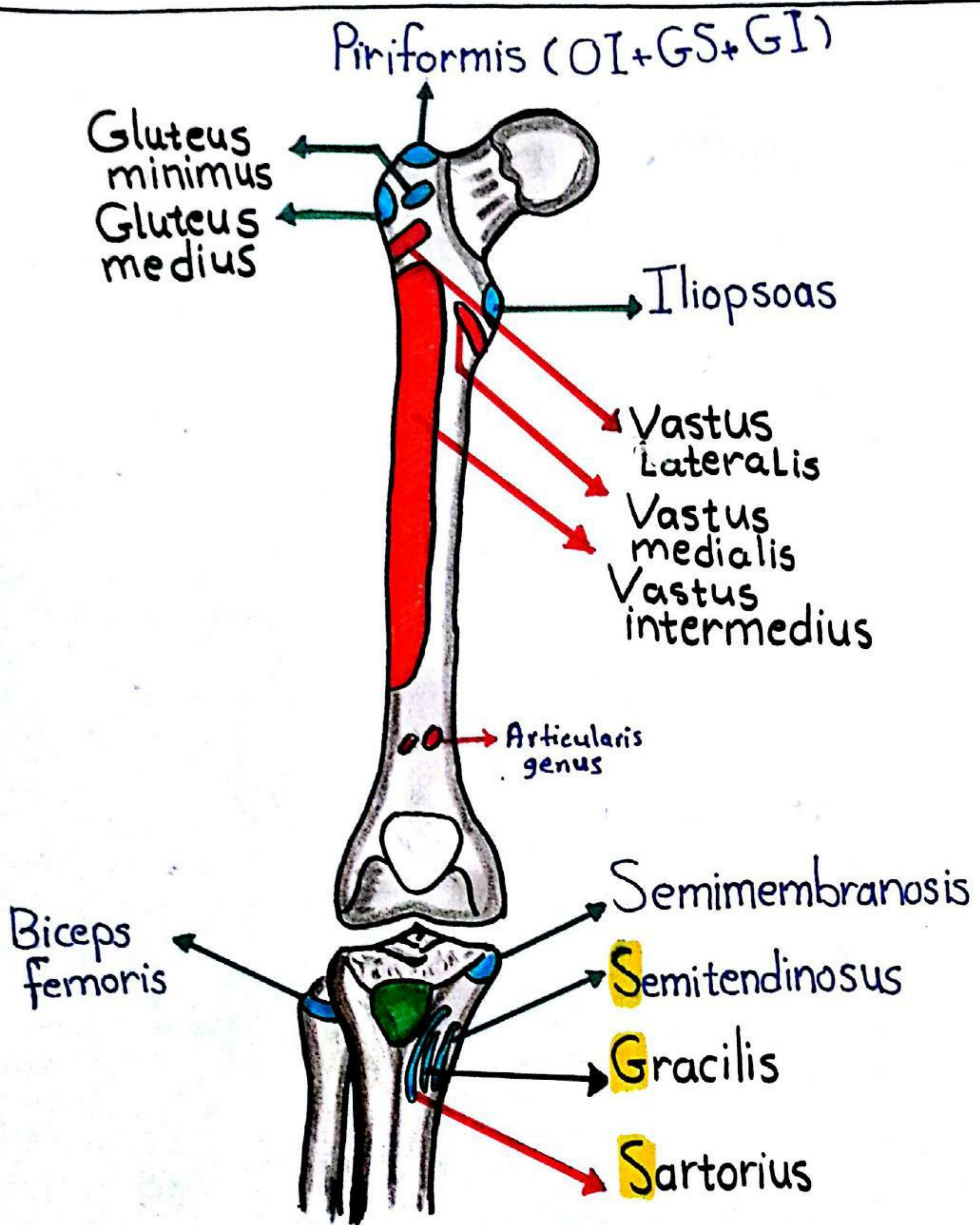


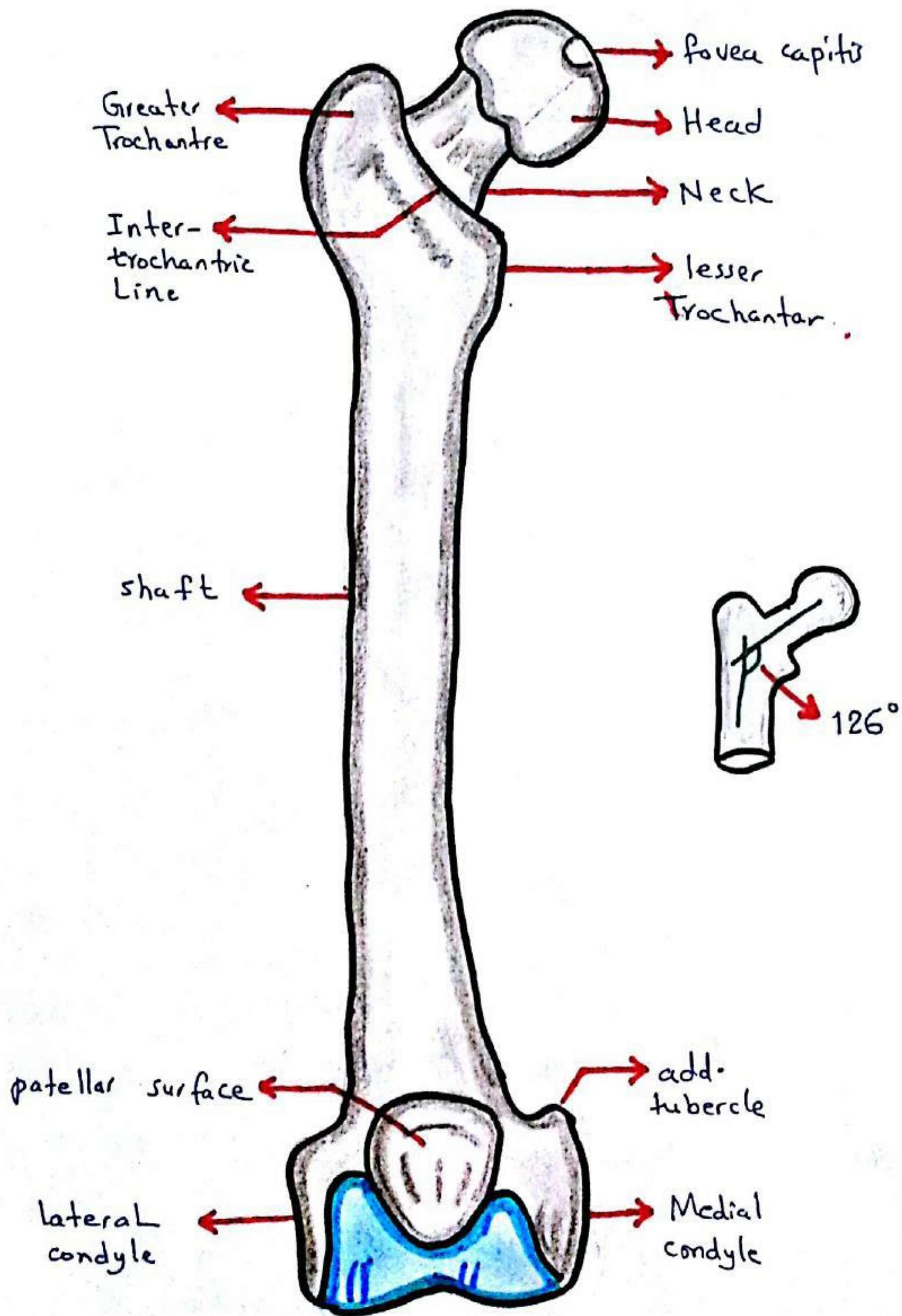


"posterior view"









Anterior view of femur